The Northwestern MILLER
MILLING PRODUCTION SECTION

Relation Between Grain Characteristics And Yield of Flour

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(Translated from Die Muehle)

TRANSLATOR'S NOTE: In accepting the findings reported by the authors of this article, consideration should be given the circumstances that, in a deficiency country such as Germany, the mill mixes represented by the wheat samples are very likely composed of both domestic and imported wheats from widely scattered producing areas. Accordingly, the wheat samples might be expected to differ considerably from one another as to proportions of dissimilar classes of wheat.

In the case of a more homogeneous mill mix, as, for instance, all northwestern spring wheat, it is believed that a better degree of correlation between test weight and flour yield would appear to exist.

The Mohs Ash Table referred to was first introduced and accepted as a sort of improvised guide supposed to relate flour ash to yield percentages, when flour grades based on ash contents were established by government decree. It was supposed to provide guidance until ash testing facilities could be made more generally available.

* *

The prospective flour yield is one of the most important factors to be considered in connection with the task of selecting and evaluating wheat for milling. The relation of yield potential of any given lot of wheat to the flour yield actually obtained from it in commercial mill operation is a measure of the correctness of the preparation of the grain, of the suitability of the mill flow and of the operative miller's proficiency in making the necessary regulatory adjustments. In short, this relation constitutes a measure of profit from the operational standpoint.

A number of cereal technologists have investigated the problem of flour yield possibilities as related to various quality characteristics of the bread grains. Most of the more recent research has led to the conclusion that the test weight is not a reliable indicator for the purpose of estimating flour yield and should be regarded as rather outdated in this respect.

Because commercial wheat flour is (in Germany) graded in accordance with officially prescribed percentages of ash content for the several grades, the ash content of the wheat determines to a great extent the possible flour yield. The percentage of bran coat component of the wheat, on the other hand, constitutes the measure of the amount of endosperm matter and therefore of the theoretically obtainable flour yield.

Occasionally, determinations of specific weight, of hardness of endosperm, of thickness of bran coat and of average kernel size and 1,000-kernel weight are also resorted to with a view of providing additional information. However, in actual practice there is much lack of clarity as to the significance of any of these characteristics. It is, of course, impractical for most mill laboratories to perform all the determinations listed in order to arrive at definite conclusions. The wheat supply as generally delivered to mills is subject to continuous fluctuation of external as well as internal quality characteristics, which renders any single quality factor unreliable as an indicator of prospective flour yield.

The authors of this article conducted extensive tests of wheat samples and of the flours experimentally milled from them in order to gain a more definite pattern of information on the subject of the interdependence of flour yield and wheat quality characteristics.

Cross-Section

The samples used for the experiments, which were performed in the spring of 1953, represent a cross-section of the mill mixes of commercial mills in Germany, and special efforts were made to obtain samples differing widely in regard to test weight in order to demonstrate the inadequacy of this factor as a means of evaluation. The determinations comprised test weight, 1,000-kernel weight, hardness of endosperm, percentage of bran-coat component (method according to Pelschenke), thickness of bran coat, kernel size, moisture and ash tests.

In the tables accompanying this article, only those tests are recorded which are relatively easy to perform and which are usually carried out anyway in the average mill laboratory. The milling tests were made on our experimental mill which consists of a double stand of rolls, roll diameter 220 mm. and roll length 150 mm. (approximately 9" x 6") and a two-section sifter with 8 sieves per section. Each milling test comprised 5 breaks and one bran scrubbing, 5 sizings and 10 middlings reductions. Number of corrugations used was 6 per cm. (15 per inch) for the first three breaks and 9 per cm. (approximately 22 per inch) for the 4th and 5th breaks and the bran scrubbing. Sizings and middlings were ground on the smooth rolls. Prior to milling the wheat, samples were properly cleaned and tempered to contain 15.8% moisture, plus or minus 0.2%, at first break. Three batches were milled of each sample, each batch being 10 kg. (22 lb.) and discrepancies of results within each series were inconsequential. Extractions were in all cases carried uniformly to 71%, which produced a considerable spread in the ash content of the flours milled from the various samples. A comparison of the flour ash figures with the ash per cent appearing in the Mohs ash tables opposite the 71% extraction figure indicates whether the particular wheat must be milled to a lower extraction per cent or whether a higher extraction is possible.

In our experience to date we have found this method of proceeding with comparative milling tests more practical than the production of flour of a definite ash content and variable percentages of extraction, because it affords a considerable saving of time and work. However, with any comparative tests it is imperative that one of the two factors, either per cent of extraction or per cent of ash, be kept constant; otherwise there would be no solid basis for comparison.

Evaluation of Results

In Tables 1 and 2 are given the averages of the three milling tests made of each sample of wheat. In Table 1 the values are arranged in the order of increasing test weight. A comparison of the several columns discloses that only the specific weight increases parallel to the test weight. By way of contrast, neither the 1,000-kernel weight nor the bran coat component or the ash percentages of the wheat or of the flour, the latter being the central point of interest in these considerations, bears any orderly relation whatsoever to the test weight. (Table 1.)

In Table 2 the test figures are arranged in the order of increasing ash content of the flour, and here the relation of the latter to the bran coat component and to the ash of the whole wheat is readily recognizable. As the ash of the wheat increases, the flour ash likewise increases, ex-

(Continued on page 20a)

TABLE 1—Comparison of various grain quality factors and ash percents of experimentally milled flours, arranged in the order of increasing test weight.

Wheat No.	Test wt. lb./bu.	Spec. wt. gr./cm.	1,000 k. wt. gr.	Bran ct. comp. %	Wheat ash %	Flour ash %
1	57.0	1.35	43.0	12.3	1.84	0.63
2	58.9	1.40	36.4	11.5	1.79	0.59
3	59.7	1.41	39.2	10.5	1.61	0.49
4	59.8	1.41	39.2	13.0	1.80	0.62
5	60.2	1.42	38.8	12.6	1.79	0.61
6	60.5	1.42	39.2	11.6	1.75	0.60
7	60.6	1.41	41.9	11.4	1.70	0.54
8	60.7	1.45	45.7	11.4	1.76	0.60
9	61.9	1.48	40.0	12.0	1.89	0.64

Bran coat component and ash values of wheat and flour in this table are on moisture-free basis.

TABLE 2—The values presented in Table 1 arranged in the order of increasing ash content of the flours.

Wheat No.	Flour ash %	Wheat ash %	Bran ct. comp. %	Test wt. lb./bu.	Spec. wt. gr./cm.	1,000 k. wt. gr.
3	0.49	1.61	10.5	59.7	1.41	39.2
7	0.54	1.70	11.4	60.6	1.41	41.9
2	0.59	1.79	11.5	58.9	1.40	36.4
6	0.60	1.75	11.6	60.5	1.42	39.2
8	0.60	1.76	11.4	60.7	1.45	45.7
5	0.61	1.79	12.6	60.2	1.42	38.8
4	0.62	1.80	13.0	59.8	1.41	39.2
1	0.63	1.84	12.3	57.0	1.35	43.0
9	0.64	1.89	12.0	61.9	1.48	40.0

Bran coat component and ash values of wheat and flour in this table are on moisture-free basis.

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A Study of the Role of Vacuum Cleaning in the Control of Insects in Flour Mills

By Albert C. Apt

Entomologist, U.S. Department of Agriculture

Vacuum cleaning of milling machinery and elevator boots following spot fumigation has become popular as a method of sanitation in flour mills between general fumigations. In order to study the effect on insect populations of vacuum cleaning alone, observations were made in two Kansas mills that were employing it. In these mills spot fumigants were used only in milling machines or elevator boots inaccessible for vacuum cleaning.

In prevous studies, Cotton and Wagner (1935) (1938), it has been shown that the insect population of flour mills is continually being augmented by insects introduced with infested wheat, and remains at a high level throughout the year if no control measures are employed. Of 2,367 8-oz. samples of stock taken from the elevator boots or purifier conveyors from 17 flour mills in Kansas, Oklahoma and Missouri in 1934-35, 80% were found to be infested. In one mill where no control measures were practiced, the average insect population ranged from 45 to 170 insects per 8-oz. sample throughout the year. Such populations are still encountered in some poorly managed old wooden mills.

In the best type of modern mill regular biweekly spot fumigation followed by vacuum cleaning can be expected to keep the insect population of milling units almost nil throughout the year, or at least less than an average of one insect per sample in the most troublesome locations. Unfortunately continuous operation of milling machinery, due to the necessity of filling orders, prevents the regular application of adequate control measures. During such periods insect populations develop to troublesome proportions.

Two flour mills, each with a capacity of 2,500 sacks, were included in the test. Mill A was of frame construction with an outside veneer of brick. It had wooden spouting and elevator boots. Mill B was of concrete construction throughout and had

Each mill was equipped with a cenmetal spouting and elevator boots.

Table 1. Insect population in elevator boots (1952-1953)—Mill A.

Boot No.*	Stock	Number of living insects per 8-ounce sample															
		1952						1953									
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
1	1st break										1				1		
2	2nd break																
3	Puregrader No. 1																
4	3rd break			2						1		3			1	5	
5	4th break																
6	1st cuts					1		1			1	25	8			11	
7	Chunk	20		1							1	1					
8	Puregrader No. 2							1				4					
9	2nd cuts											11	1		1	1	
10	Sizings											6	1				
11	Feed-in elevator																
12	Puregrader No. 3						10	2	1			13					
13	"Dead"											8			2		2
14	Purebox No. 1											3	1				
15	4th Midds.											8					
16	1st midds.											1					
17	5th break							1							3	1	
18	Shorts duster											1					
19	Purebox No. 2								2	2		8	2			1	
20	Bran											1			1		1
21	2nd tailings												1	3	6	4	
22	2nd midds.											2					
23	Purebox No. 3						1			1		2	3		11	4	4
24	Low grade											1			1		
25	7th midds.									1		8					
26	Reel No. 1									1		4	5		9		
27	Flour elevator											2			4	2	
28	Shorts duster	1															
29	Purebox No. 4										1	1			2		
30	6th midds.			1								6					
31	Coarse tailings							1			1						
32	4th midds. roll											4					
33	Shorts packer											1					
34	Fine tailings	26										3		1			
35	5th midds.											2				10	
36	Low grade agitator														1		
37	3rd midds.											6					
38	"Dead"																
39	Clear rebolt																
40	Patent rebolt																
41	Low grade reel	15										2					
43	Bran and shorts duster	38								2		3	1		5		
	Total number alive	100	0	4	0	1	11	6	3	8	5	128	23	4	48	39	7
	Average number per unit	2.3	0	0.1	0	0	0.2	0.1	0	0.2	0.1	3	0.5	0.1	1	1	0.1

General fumigation

* - Boot number 42 was omitted because of the inaccessibility for vacuum cleaning.

Table 2. Insect population in elevator boots (1952-1953)—Mill B.

Boot No.*	Stock	Number of living insects per 8-ounce sample															
		1952						1953									
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
2	1st tailings							1	5			17				**	
3	Chunk									8	16	2		2			1
4	"Dead"																
5	Feed-in																
7	Low grade		6									1		10			
8	1st break							1				1					
9	2nd break											1					
10	3rd break													7			
11	4th break											2		8			
12	Puregrader No. 1									4	3	3					
13	Puregrader No. 2																
14	1st cuts	25										33	37	30			2
15	Puregrader No. 3									9	65		45				
16	Reground bran									1	1						
17	Bran to packer									2	6						
18	5th break		6										1				
19	Sizings		2														
20	1st midds.											8					
21	Reel No. 2											2		1			2
22	2nd cuts																
23	Shorts													12			
24	Pure box											1					1
25	Patent flour to bin											1					
26	Patent flour to agitator																
27	Reel No. 1		1			1						8					2
28	Shorts duster										3	2					1
29	Pure box											2					
31	3rd midds.											7		1			
32	To 3rd midds. roll	10					1	1		3	6	3					1
33	Quality																
34	1st tailings coarse											3					
35	To clear agitator																
36	To clear bin																
37	4th midds	25										1					
38	7th midds.					2											1
39	2nd low grade											3					
41	To clear agitator																
42	To purebox											4					
43	2nd tailings	15										1	3				
	Total number alive	75	15	0	0	3	1	3	5	27	102	104	86	70	0	-	11
	Average number per milling unit	1.7	0.3	0	0	0	0	0	0.1	0.6	2.4	2.4	2	1.6	0	0	0.2

General fumigation

No stock in elevator boots

* Boot numbers 1, 30, and 40 were omitted because of the inaccessibility for vacuum cleaning.

** At the end of August 1953 the mill was not run and all stock was removed from the milling units. In October 1953 operations were started.

EDITOR'S NOTE: The author of the accompanying article is an entomologist with the Stored-Grain Insects Laboratory at Manhattan, Kansas. This laboratory is one of the field stations of the Agricultural Marketing Service, Marketing Research Division, Biological Sciences Branch, Stored-Product Insects Section, U.S. Department of Agriculture.

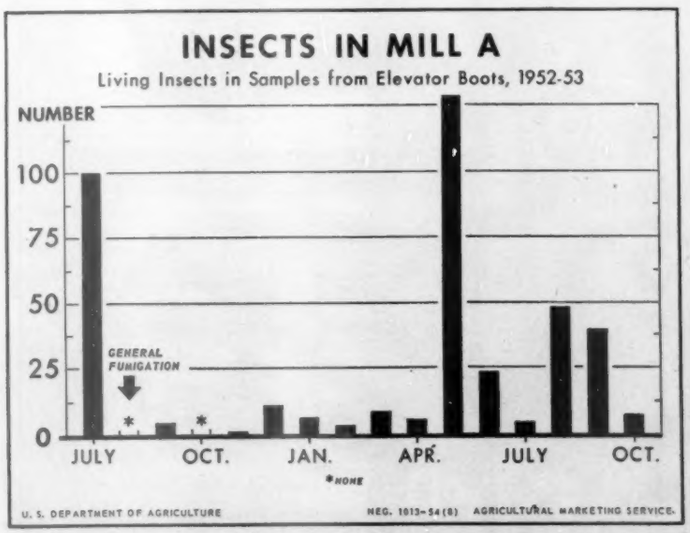

FIGURE 1 — Living insects found in samples taken from elevator boots in Mill A, July, 1952, through October, 1953.

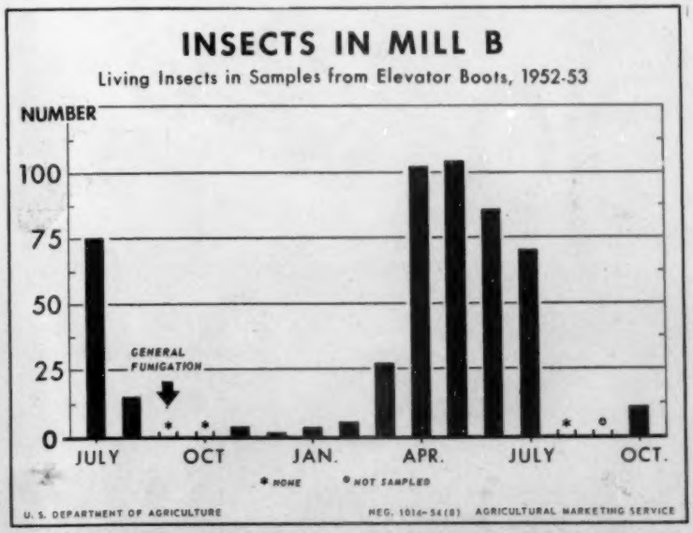

FIGURE 2 — Living insects found in samples taken from elevator boots in Mill B, July, 1952, through October, 1953.

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Table 3. Operation costs of vacuum cleaning and spot fumigation of two flour mills.

Mill A	Mill B
Labor Costs*	
8 hours per week $10.50 per week†	7 hours per week $12.25 per week†
Spot Fumigant‡	
$1.60 per gallon 5 gallons per week $8.00 per week	$1.60 per gallon 4½ gallons per week $7.20 per week
Cost of Labor and Spot Fumigant for One Year	
$962.00	$1,011.40

*All costs cover period from October, 1952, through October, 1953.
†Labor costs figured on a basis of straight time.
‡Ethylene dibromide 6.6%, carbon disulphide 12.1%, carbon tetrachloride 81.3%.

trally located vacuum unit, with connecting ducts leading to various parts of the mill. Connections were provided at convenient locations so that the cleaning tube could be attached and the different milling units cleaned by inserting the intake end of the hose into the unit.

The milling machinery and elevator boots were divided into three groups that were cleaned on the first three consecutive week-ends of each month.

Once each month 8-oz. samples of stock were removed from the elevator boots of each mill and examined to determine the number of living insects. Because of the staggered program of cleaning, samples were necessarily taken from some boots one, two, or three weeks after cleaning.

In certain cases where milling machines, including elevator boots, were inaccessible for cleaning, spot fumigations were given in lieu of cleaning. Whenever a milling machine was found to have an abnormally high insect population, a spot fumigation was also applied here.

No attempt was made to secure uniformity of treatment in the two mills, and it is likely that the work crews of the two mills differed considerably in their relative efficiency.

It should be noted that milling stocks of wheat on hand became exhausted during February, and local supplies of wheat had to be used.

Results

Removal of stock from milling units at periodic intervals with a vacuum cleaner held the insect population of the test mills to a relatively low level, apparently by mechanically removing a large percentage of the insects present and thus interrupting their breeding cycle.

From the data in figures 1 and 2, it may be seen that insect populations reached a peak in May and were generally higher during the summer months than at other times of the year. Although a few individual units showed a high insect population during certain months (Tables 1 and 2), the average infestation was maintained at a low level throughout the year considering the fact that cleaning operations were staggered over three week-ends in each month.

In Mill A the stocks carrying the heaviest insect infestations were in

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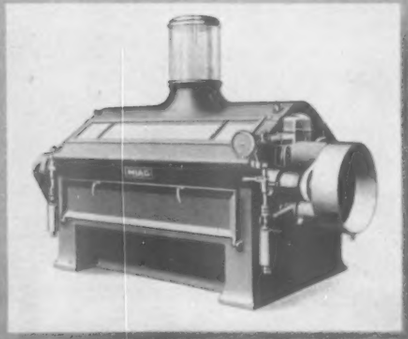

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descending order: bran and shorts duster, 1st cuts, feed-in elevator, purebox No. 3, and chunks. In Mill B they were: 1st cuts, puregrader No. 3, chunks, 4th midds. and 1st tailings.

Cost of operation figures for the two mills are given in Table 3. At Mill A the total cost per year was $962, at Mill B, $1,011.40.

Evaluation of Results

Although the vacuum cleaning alone did not reduce the insect populations in the test mills to the extremely low level that would be expected by the systematic use of spot fumigation followed by vacuum cleaning, it did hold them to a relatively low level. (The highest average per boot at any sampling was 3 in Mill A and 2.4 in Mill B).

It is probable therefore, that vacuum cleaning alone could be relied upon to hold the insect populations in check in an average mill, for periods of several months, during periods when it became impractical to shut down the milling units long enough for spot fumigations. This would be particularly true during the fall, winter and spring months when the insect activity is apparently not as great as during the summer.

• • •

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Cotton, R. T., and George B. Wagner, 1938. Practical methods for insuring the production of insect-free flour. USDA Bureau of Entomology and Plant Quarantine Publication, E-419, 8pp.

——BREAD IS THE STAFF OF LIFE——

Course in Packaging, Materials Handling Set for Sept. 19-21

NEW YORK — The Society of Industrial Packaging and Materials Handling Engineers' 1955 "short course" will be held Sept. 19-21 under the joint sponsorship of the society and New York University at NYU's College of Engineering.

Subjects to be covered will provide engineers with an intensive review of the basic technical principles used in packaging and materials handling, a survey of modern application of these principles, a summary of recent developments in the field and reports of research projects now underway to provide continued progress and constant improvement.

The course will also include a one-day session of special interest to management, pointing out the relation of packaging and materials handling engineers to other departments within an industrial organization. In addition, there will be a one-day conference on consumer packaging and its importance to modern merchandising.

Along with its short course, the society is holding its annual Industrial Packaging & Materials Handling Exposition at Kingsbridge Armory, close to NYU's engineering campus.

——BREAD IS THE STAFF OF LIFE——

Mill Superintendent

EAST ST. LOUIS, ILL. — John J. Schindler has assumed the duties of mill superintendent at the Dixie Mills Co. here. The firm produces poultry and livestock feed. Mr. Schindler is a graduate of St. Louis University.

Appraisals and Insurance

• • •

By George Patchin

Would you be interested in this quotation for some machinery?

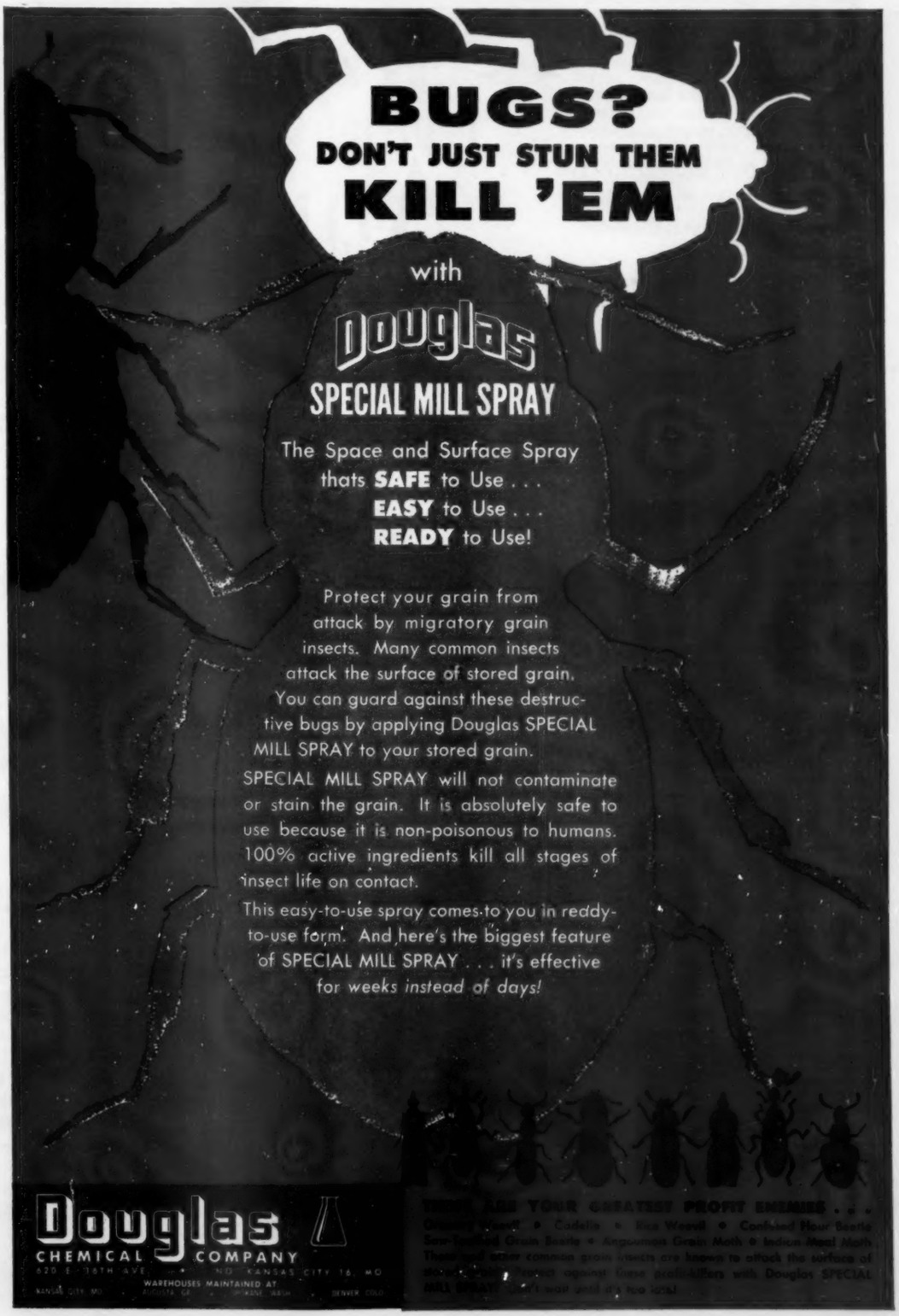
One new 9 in. x 36 in. double roller mill, 2 pr. corrugated rolls, c.o. bearings, style A drive—$950, f.o.b. Milwaukee. Would you buy at that price? That was the 1902 quotation. In 1928 that roller mill would have cost $2,340; in 1934, $2,890; in 1950, $3,523; in 1955, $4,932.

This kind of figures explains why we make appraisals.

The discussion of valuations of industrial property might be somewhat of an academic one. As a business man I would like to clarify what I mean by valuations and appraisals that apply to practical dollars and cents savings.

There are, believe it or not, several kinds or types of value, all of them accepted in their own field. There is market value; that is the type of an

EDITOR'S NOTE: The author of the accompanying article, George Patchin, is president of Patchin Appraisals, Inc., Minneapolis. This article is from a talk by Mr. Patchin at a meeting of the Michigan State Millers Assn.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appraisal that the realtor uses when he says he can sell your property for ..... dollars. That same market value goes into the mortgage loan business; it is essentially sale value.

The used machinery dealer, when he says "appraisal," is talking about liquidation value—what the equipment will bring on the market under the hammer or other forced sale.

The accountant is talking about original cost, historical cost, with depreciation according to federal tax standards.

Reproduction Cost

Now my approach to valuation and appraisals is none of these. I am interested in replacement and going concern value; that is, reproduction cost less physical depreciation. This is the value of your property in operating condition, with all machinery and equipment in place.

Now before we go into detail as to why make such an appraisal, I am going to quickly review appraisal procedure and outline briefly how such a survey is made. Then we will know more about the available material on hand and how we can use it.

1. A plat is made of the property showing insurance division and building numbers.

2. A detailed inventory is made of the buildings and building equipment, such as lighting, heating, plumbing, sprinkler system, building elevators, etc.

3. A detailed inventory is made of machinery and equipment by classifications, such as bucket elevators, conveyors, bins, hoppers and spouting, warehouse trucks, miscellaneous plant equipment, electric power distribution, machinery and boiler room equipment. This inventory is taken on a unit system. For instance, with a machine such as a roller mill we will list size, type, drive, belts, idlers and drive pulley on line shaft, freight and installation. With an individual motor driven unit also included are the motor, the control, and the wiring to the distributing panel.

4. This inventory is priced on a basis of present day cost of reproduction. (Original cost is disregarded). Allowances and adjustments are made for local costs, both for labor and material.

5. The major parts of the inventory are depreciated according to physical condition; future use value is the prime consideration. For instance, a well maintained roller mill will probably be completely written off your books, but most of the physical value is still there.

6. The report is tabulated and summaries are made showing values by buildings and by classification. Separate summaries are made for both reproductive and sound value because today many plants are insured on a basis of reproductive value.

Now we have a good inventory of the plant, a good basis for a property record system, if you want to use it for that. Some of the larger mills do use the appraisal as a part of their property records.

What we have accomplished for the most part is an accurate insurance valuation of the property. Whether your insurance is written on a replacement or sound value basis (and providing, of course, that you have a good appraisal), you are in possession of a provable basis for your property insurance.

Insurance based on an appraisal is paid promptly — without argument when that unwanted fire occurs. You and you only are responsible for proof of loss. The fact that your insurance company has accepted premiums based on ..... dollars value does not mean they will pay on that value. They might pay on one half of dollar value. Let's look at it.

First you may possibly, though improbably, be over-insured; then you are pouring dollars down a hole. You can collect only for the value of your property.

Second, you are most likely under-insured (unless your values are based on an up-to-date appraisal). Most firms operating without a recent appraisal are so grossly under-insured that the figures are fantastic.

Co-insurance Clause

Your property insurance is written with a co-insurance clause; sound value insurance with an 80% or 90% clause and replacement insurance with a 100% clause. Now co-insurance is just what the term implies—it is a partnership with the insurance company. When a property is rated, it is based on a rate known as straight insurance—one rate for the building, usually a higher rate for the contents. Now the closer to full value you will insure, the greater the reduction in rate they will allow you, and the savings are quite considerable, so you agree to carry up to say 90% full value. In return they allow you a reduction, but there are penalties if you do not keep your part of the bargain.

In the fine print you will see this typical co-insurance clause—"This company shall not be liable for a greater proportion of any loss or damage to the property described herein than the sum hereby insured bears to ..... per centum (.....%) of the actual cash value of said property at the time such loss shall happen." Remember that property values have more than doubled since 1945.

Now assume that you think your property is worth $1 million. You would then under the 90% clause buy $900,000 insurance. A loss occurs. If total, you collect the full amount of the insurance, $900,000, provided you can prove your loss. Suppose, however, that the loss is $100,000, the

DOW

Announcing a major development in the fumigation of bulk grains...

QUICK! UNIFORM! SURE! CUTS MATERIAL COSTS 50%

It is now possible to fumigate grain with methyl bromide in silo-type grain elevators.

Dow's new method of forced recirculation enables the operator to disperse an even flow of methyl bromide air mixture through the grain mass at a given rate per bushel per minute. The new process is quick, uniform, sure. It takes the guesswork out of grain fumigation because it is *engineered* to make fumigation of bulk commodities an exact science. Controlled distribution of methyl bromide means lower dosage . . . *cuts material cost at least 50 per cent* . . . and gives complete kill of all insect life in the bin. *There is no question about results.*

Dow was the first fumigant manufacturer to work on this important new process. We have tested the forced recirculation method using methyl bromide in many types of installations for more than seven years. As a result, Dow is an authoritative source of information and technical assistance. This is a major development in the fumigation of grains, and should also have application in the fumigation of peanuts, popcorn and other materials stored in bulk. Our tests have proved conclusively that when the installation is properly engineered and the amounts of methyl bromide used are correct—*there is no question about results.*

adjuster first determines whether or not you have complied with your agreement. If you have and he agrees that your values are reasonably near a million dollars you get your full $100,000. If, however, he finds that your values are more—say $1½ million—here is what happens. You should have had 90% of $1½ million or $1,350,000 insurance. Now under the terms of the clause he pays you $900,000 divided by $1,350,000, or 90/135 or 67½% of the loss or $67,500. You are out of pocket, you are sore at the insurance company and your broker and wish you had bought an appraisal.

Here is an example of what can happen. A Minneapolis feed mill had an appraisal a year ago last spring. They adjusted their values and made quite an adjustment. In June just a year ago they had a fire of about $200,000. They got paid in full, but just for fun we worked it back to see what would have happened if the fire had occurred before the appraisal. They would have collected about $45,000. Thus, better than $150,000 was saved on an expenditure of less than $3,000 for an appraisal. These people had never had an appraisal before and had been guesstimating."

A recent revision of an appraisal of a medium-sized southwestern mill showed an increase of value from 1950 to 1955 of 26%, and only normal changes and improvements had taken place in the interim. Another midwestern mill over the four-year period of 1950 to 1954 had made a lot of improvements and its property department, which by the way is a good one, had tried to keep track of the additions and deductions. They had added and subtracted all recorded changes in the mill and yet were off several million dollars, amounting to 30%.

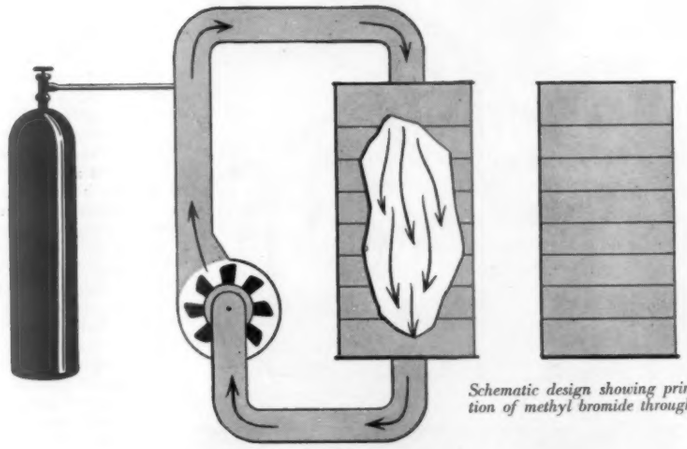
The catastrophic loss, while crippling, is not the common loss. The $50,000 to $200,000 loss is the ordinary loss, and nobody nowadays can afford to take part of it himself.

Records, no matter how carefully kept, do not tell the story. Your accounting department charges everything possible to expense. That is good accounting and tax procedure, but it is woefully inadequate for insurance purposes. In the first place, the accountant's base is historical cost; the insurance base is reproductive cost. Accounting depreciation is "the maximum" the law allows; the insurance depreciation is actual physical wear and tear. Good maintenance can almost nullify depreciation.

Reproduction insurance is becoming quite popular, especially on larger properties. This usually requires 100% co-insurance or full value. It is more than ever necessary to keep values up to date with this type of coverage. Why reproductive insurance? Your reserves, cash or otherwise, are not sufficient when added to the sound value insurance, to build a new plant when the old one is destroyed.

——BREAD IS THE STAFF OF LIFE——

NEW FORCED AIR RECIRCULATION PROCESS DISTRIBUTES DOW METHYL BROMIDE UNIFORMLY THROUGHOUT THE BIN ... ELIMINATES GUESSWORK



Schematic design showing principle of recirculation of methyl bromide through silo bin.

ENGINEERING SERVICE IS AVAILABLE

Roughly, the new method involves a permanent or semi-permanent installation for the recirculation of lethal concentrations of methyl bromide throughout the grain mass. We have adapted the process to both silo-type storages and to bulk shipments of grain under quarantine in freight cars. This important new method is now ready to give *you* top fumigation effectiveness in your storage facilities. You are invited to take advantage of Dow's engineering service on the installation of forced recirculation equipment utilizing methyl bromide. We will gladly send a Dow fumigation technician for consultation and assistance. Write our Fumigant Sales Section.

THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW FUMIGANTS DOW

Production Engineering Show Will Be Held Sept. 6-16 in Chicago

CHICAGO — A Production Engineering Show, a new series of annual expositions which will feature equipment for automation and production in all types of industries, will be held in Chicago in September, according to Clapp & Poliak, Inc., New York, producer of the event.

Almost 250 companies will have displays at the show at Navy Pier, Chicago. The exposition will take place Sept. 6-16, at the same time as the Machine Tool Show at the International Amphitheatre.

A feature of the Production Engineering Show will be a joint presentation by eight universities of their latest research in fields which have an important bearing on industrial production.

The universities are Case Institute of Technology, Cornell University, Illinois Institute of Technology, University of Illinois, Massachusetts Institute of Technology, University of Michigan, Northwestern University and Ohio State University.

Among the various types of equipment to be on display at the Production Enginering Show will be monitoring equipment, governing equipment, special production equipment, materials handling equipment, communications equipment, inspection and gaging equipment and equipment components.

——BREAD IS THE STAFF OF LIFE——

M. M. McGuire Joins Screw Conveyor Corp.

HAMMOND, IND. — Martin M. McGuire recently joined the sales staff of Screw Conveyor Corp., Hammond. His territory includes Indiana, Ohio, Michigan and Kentucky.

A graduate of Iowa State College, Mr. Hammond has been operating his own company in El Monte, Cal., specializing in metal fabricating and the building of truck bodies for the feed industry, also, the installation of bulk storage plants for feed and completed feed mills in California and Mexico.

After service in World War II, Mr. Hammond attended the University of Wisconsin and later became Iowa-Nebraska district representative of an eastern flour and feed mill equipment manufacturer.

The History and Progress Of Sifters and Sifting

By George J. Tesarek
The Quaker Oats Co.

Sifting was mentioned by Homer in his "Odyssey" (song 7, vv. 103 and 104) where domestic life at the court of King Alcinous is described: "Full fifty housemaids form the household train. Some turn the mill or sift the golden grain." Shakespeare in his play "Troilus and Cressida," placed in the period of Trojan Wars, described grinding and bolting in a dialogue. Sifting or bolting was in existence some 3,000 years ago. It's a factor today and in all probability will be prominent a hundred years from now, providing people don't change to a diet of capsules.

The practice of bolting (the first sieve) dates back to the time of the Egyptians and is almost as old as the first hand grinders. These crude sieves had covers made of papyrus reed by the Egyptians, of horse hair by the Gauls, and much later of linen by the Spaniards, flax and wool by others.

Flour, or rather meal, came in three grades, coarse, medium and fine. The sieve used in the primitive days was operated by hand, swung in a gyratory motion or with a side-shake motion and occasionally hit against some object.

EDITOR'S NOTE: The story of sifting and sifters is an important part of the story of the milling industry. In the accompanying article George J. Tesarek of the Quaker Oats Co., St. Joseph, Mo., traces the history before proceeding to describe the progress to the modern practices of today. The article is from a talk given by Mr. Tesarek at a joint meeting of Districts No. 3 and No. 6 of the Association of Operative Millers.

The first sieve frames were made of wood, either round or rectangular; still others were plain baskets with mesh in the bottom. Hand sieves were used for thousands of years, with very slight improvement of frame and sifting media. Early American millers used wire for bolting, this wire being made in England, and during the Revolutionary War the supply was cut off. The Americans approached Dutch manufacturers of fishing nets to make bolting cloth like their nets, but of sufficient fineness of mesh to sift flour from bran. The Dutch were successful in supplying the Americans with the proper material and this replaced the English wire.

At the end of the Revolutionary War Oliver Evans built his first automatic flour mill in 1783, and used a reel separator for bolting. Evans' mill is considered the grandaddy of our mills of today.

Silk Bolting Cloth

The Swiss in 1820 were making bolting cloth and H. Bodmer in 1835 produced the first silk bolting cloth, which today is in all probability the most used by the milling industry. Of course, wire cloth in various materials such as phosphorous bronze, stainless steel, plated wire, and various synthetic materials such as nylon, combination nylon and silk or goat skin, etc., are used.

Let us continue along the road of progress. We had the hand sieve, the first man-powered reel, next the power of water and windmills, but these methods were still primitive. The scalping shoe was used in a limited capacity; in fact, it still has numerous places of use today. The reel was round and hexagon, and then came the differential and centrifugal machines. With the above reels requiring considerable floor area and power, came the deficiency of limited capacity.

The human mind kept on thinking about the primitive hand sieve, which was used for some 3,000 years in one form or another.

The miller was stumped, and let us not forget he was among the first to harness mechanical power. He was unable to balance the opposing forces when he gyrated a sieve by mechanical power. The first successful counterbalanced sifter was Hagenmach's Plansifter, built in Austria in the 1880's. It was a reed-suspended bolter, with a floor stand supporting the counterbalanced drive.

Diamond Jubilee

We can safely say that the milling industry is about to celebrate its diamond jubilee, or 75 years of more or less using the milling system we know today. It was in the 1880's the roller mill, purifier and sifter made their appearance on the American milling horizon. There have been various improvements made to give us the modern mill of today, but basically the equipment is the same. The only revolutionary change in mills today is not in the milling, but in the auxiliary equipment — such as the bucket elevator giving way to the

world-renowned for...

GREATER PRODUCTION
LOWER MAINTENANCE
LESS DOWNTIME

BUHLER 4 Roller MILL

Engineers for Industry Since 1860

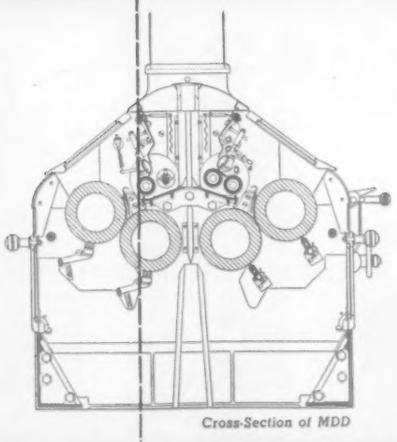
Performance with more than 70,000 units throughout the world gives strong evidence that Buhler 4-Roller Mills can increase your production, cut your maintenance costs and reduce downtime.

Millers everywhere recognize the "*Buhler*" as the world's best roller mill for flour milling. Many automatic and advanced features provide outstanding advantages. And you get a beautiful piece of machinery that is a credit to the appearance of any mill.

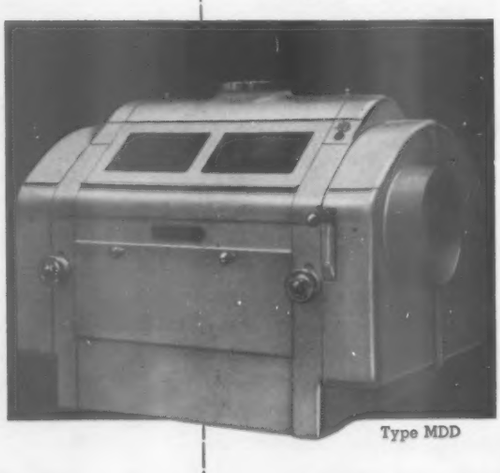
It's a stronger, more streamlined, more compact mill. A Buhler 10" x 40" mill occupies the same space as a conventional 9" x 36"— provides 10% more capacity in the same floor area.

The "*Buhler*" is infestation-proof — no spots for insects to breed. High quality rolls insure even grinding, higher extraction, and greater capacity. Simple, uniform, double-roll UNIC feeder is automatic. Feed rolls and grinding rolls are interlocked.

Self-aligning, U. S. Standard roller bearings permit higher speeds, greater capacity, and save up to 20% power as against sleeve bearings. No need to replace gears when roll diameter decreases due to special conical gears.



Cross-Section of MDD



Type MDD

OPTIONAL FEATURES

- Automatic engaging and disengaging of the grinding rolls by pneumatic means to protect rolls.
- Water-cooled grinding rolls for better flour extraction and uniform grinding.
- Choice of chain drive instead of gear drive.
- 4-speed regulator for feed rolls.

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Engineers for Industry Since 1860

37?

newly-developed pneumatic system of handling mill stocks.

Let us return to Hagenmach's sifter. The development of today's sifter was carried out in two separate worlds, the Old and the New, separated by 3,000 miles of ocean. As you know, this separation held true in the milling industry, or let us say in the mill building industry up to about 10 years ago. The European manufacturers kept the basic arrangement of Hagenmach's sieves, with sieve transport flights, each sieve frame forming a part of the box, developing the mechanical sieve brush for cleaning the silk cover. But they did develop numerous free swinging drives, some of them high speed, that have been in use for 40 or 50 years.

On the other hand the Americans kept mostly the floor suspended drive (Nordyke, Allis—with its plansifter, Universal and Perfection bolters, Great Western, Wolf, and Barnard & Leas) and others. Quite a few years ago Wolf and Barnard & Leas developed free swinging drives for their sifters, but these came into only limited use. It has been only in the last five to 10 years that the remaining mill equipment manufacturers developed true free swing drives for sifters.

Early Sieves

The first sieves were all plansifter style sieves. The American plansifter differed somewhat from its European brother in that it used coffee or other beans for cleaning of coarser scalps and wheat for cleaning the flouring sieves, the latter being recirculated by an elevator from the bottom sieve to the top sieve.

One outstanding development was the square sieve designed by Nordyke and Marmon in 1902. Other sieves were developed, of drawer type, but none survived as well as the square sieve. Today most American manufacturers are using the Nordyke square sieve which has a bolting area 2.6 square feet per frame, or a larger sieve of 3.9 square feet of bolting area which is used by another manufacturer, who formerly used the drawer type sieve. The drawer type sieve sifter has a tendency to leak, and it is hard to keep clean from a sanitation standpoint, which today is more prominent than ever before. Another point is if you ever need to reflow a drawer type sifter box, you simply rip the insides out and start all over.

You will notice the majority of sieves used in American mills are of the square stack type.

First of all, let's dispense with the discussion of shakers and reels and talk about the sifters. Any sifter, regardless of make, must be installed properly and must be level. The level of box and drive should be checked from time to time. Ceiling and box reed hangers should be checked on a routine basis, especially free swing drives. (Some are equipped with steel safety cables.)

The box and drive must be properly counterbalanced for desired circle of gyration. Many times a new machine installed will not prescribe the desired circle of gyration and it is necessary to add weights. The drive must rotate freely.

Let us discuss the square stack type sifter. It can be built as a 2, 4, or 6-section machine from 10 to 27 sieves. There have been a few 34-sieve machines built. I have also seen Nordyke type sifters of 8 or 10 sections, but they were of either 10 or 12 sieves.

Here are some outstanding points about the stack-square type bolter:

(1) High bolting capacity.

(2) Possible to make 8 separations if desired.

(3) Requires considerably less space than a plansifter.

(4) Can be easily reflowed.

(5) Sieves interchangeable anywhere in the stack (24 11/16" square) —standard height 2¼".

(6) One man can do sieve repairs.

(7) Cloth cleaners or rubber balls used for cloth cleaning.

(8) Leather or balata belting used for pan cleaning.

(9) Easy to keep sanitary.

(10) All standard sieves are of same cloth size, 19 11/16" x 21 13/16", giving a net bolting area (deducting for crosspieces and corners) 2.6 square feet per sieve.

(11) It is not necessary to use any stock transport flights on sieves; therefore, machine can run clockwise or counterclockwise without trouble.

To give you an idea as to the number of different type sieves available for a Nordyke square sifter, Allis-Chalmers has available the following:

Type A and AA—some 200 different sieves.

Type B and BB—some 80 different sieves.

Type D—4 sieves.

Type E—7 sieves.

Type G—7 sieves (for break scalps).

Type M—Throw back blank sieves, 29 different frames, and some 75 different kinds of hold-down boxes for the Nordyke sifter.

It is said the Chinese language has some 7,500 different characters, but the average man needs to know less

An Entirely New Concept in Grain Protection

Now, after 5 years of research and field testing, Douglas brings you the first practical answer to the problem of costly grain losses due to insect infestation.

Douglas TETRAKOTE is a long-lasting, economical liquid grain protectant. It is applied when clean grain goes into storage or when stored grain is turned, and keeps grain insect-free during normal storage periods.

WHY IS TETRAKOTE SO DIFFERENT?
Because it stops insect damage before it gets started. With old methods grain was fumigated after insects appeared and after damage had occurred. TETRAKOTE prevents weevil infestation rather than checking it once it gets started.

HOW LONG DOES PROTECTION LAST?
A full year! One application of Douglas TETRAKOTE will provide positive protection for periods up to 12 months when applied according to directions.

WILL TETRAKOTE WEAR OFF?
No! TETRAKOTE is formulated to stay on during normal handling. Grain treated with TETRAKOTE can be turned, moved, shipped or handled in any way without reducing the effectiveness of the protective coating.

IS TETRAKOTE EASY TO APPLY?
Yes! Douglas TETRAKOTE can be applied quickly, easily at the time grain is placed in storage or when it is being moved or turned. Can be applied with the Douglas TETRAKOTE Applicator. Your Douglas representative will assist you in working out the best method for your operation.

IS TETRAKOTE ECONOMICAL TO USE?
Definitely! In fact, it costs you more not to use Douglas TETRAKOTE. Insects can easily cause losses amounting to 70c or $1.00 per bushel in 8 to 12 months. The average cost of applying TETRAKOTE is less than 2c per bushel. One application of TETRAKOTE more than pays for the cost of the protectant.

IS TETRAKOTE SAFE TO USE?
Yes! The insect killer in TETRAKOTE is harmless, when used as directed, to the milling, eating and germination qualities of grain. It is approved for application directly on grains and seeds used for human consumption.

MAIL THIS COUPON TODAY...GET ALL THE FACTS!

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620 East 16th Avenue Dept. MP
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WAREHOUSES MAINTAINED AT:
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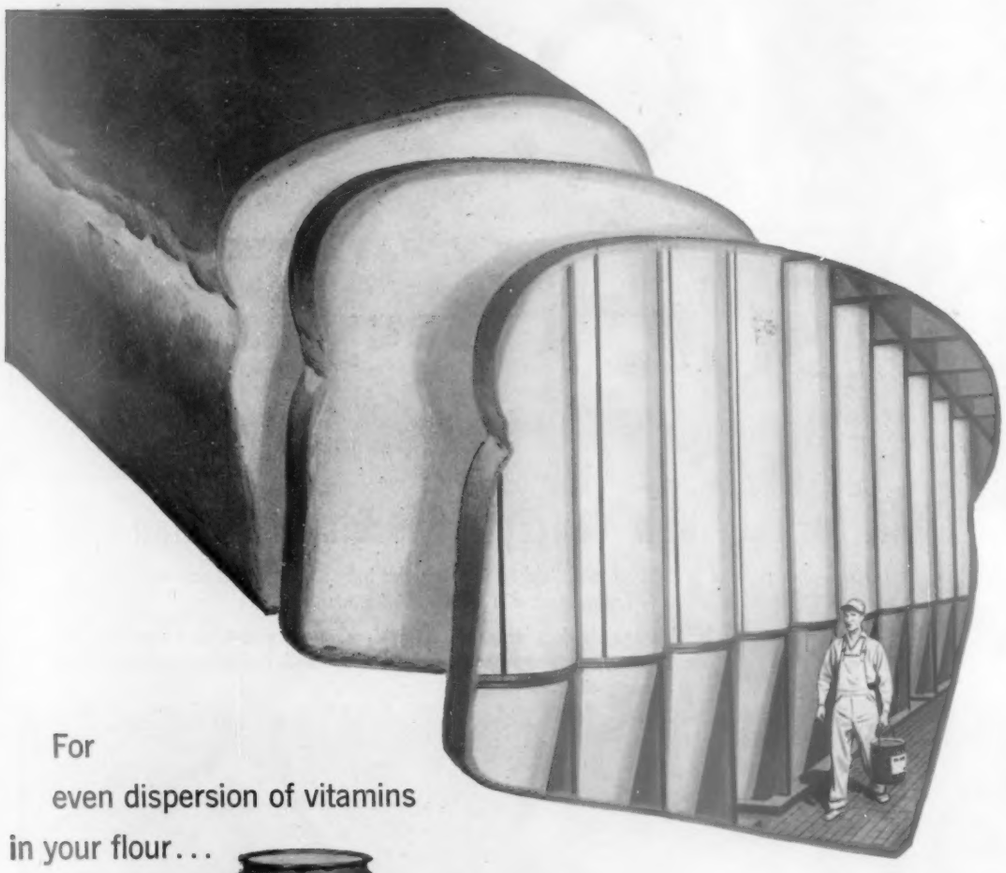
SUPERIOR CARBIDE TOOLS
For All Roll Corrugating
Economical Increased Output
CORRALLOY TOOL CO.
Minneapolis 7, Minn.

than 1,000 symbols to be able to communicate. The approximately 300 different sieve types available to the miller can be boiled down to a dozen or a dozen and a half of various kinds of flouring and scalping sieves.

Rules

To make our sifters perform properly quantity- and quality-wise, we must follow these rules. Our sifter must have:

1. Proper balance, throw and speed of machine.
2. What kind of stock weights and percentages are we grading.
3. Balance of stock in relation to other sections of machine, especially important where bronze bearings are used, not so critical with antifriction bearing.
4. Stock entering sifter properly, especially if two or more sections used on same stock; also important if stock is checked for separation of fines before entering sifter.
5. Sifter top to have proper clearance between bottom of hold-down and outside sieve frame, cutting down tail-over opening.
6. When sifter is used for rebolter, a large volume of flour flows over sieve. It is better to make double sections out of a rebolter box, with slightly built-up sieve (2½" instead of 2¼") for 2.6 sq. ft. sieve, these being double tail-out sieves for quick discharge of flour into the sieve channel and out of the sifter.
7. If a high speed sifter is used, 265 r.p.m., 2½" throw, you sometimes experience "flotation" or fluctuation of your stock from discharges of the bolter. Most Nordyke sieves were made for 180 r.p.m., 4" throw machines, and have generally ⅛" pitch on sieve from head to tail. This can



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even dispersion of vitamins
in your flour...

USE PFIZER BI-CAP®
the original enrichment concentrate

● BI-CAP consists of small, uniform-size particles. It's made that way to give you two advantages: 1. *free flow* from either displacement or roller types of automatic feeding devices . . . 2. *even blending* throughout your flour.

Besides assuring equal vitamin enrichment of every portion of your flour, BI-CAP provides *ample* enrichment. You're safe...by a margin of at least 10% over minimum standards...when you add BI-CAP at recommended levels.

One of the three types of BI-CAP is sure to meet your needs. You have a choice of single strength products with reduced iron or iron pyrophosphate, or a double strength product with reduced iron. All three forms of BI-CAP are made with Thiamine Mononitrate for improved Vitamin B_1 stability.

Contact Pfizer and a warehouse near you will quickly provide BI-CAP in handy 25-lb. steel pails. Also ask about BI-CAP Corn Meal Enrichment Mixture for degerminated corn meal and BI-CAP Macaroni Enrichment Mixture.

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LOW-DOSAGE
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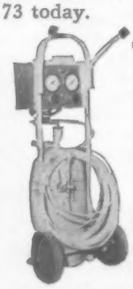
JUST
Punch and Pour
in same fumigation ports now used: Discard can and move to next point. Dawson 73 in two-inch shot can carries knock-out strength of about a quart of conventional fumigant. No more pouring from shipping containers to applicator bottles . . . no wasted time . . . no fumigant lost . . . no broken glass. Your costs will be much less. Prove it to yourself. Order case of 48 cans Dawson 73 today.



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for MAXIMUM MILL EFFICIENCY
There's nothing like the "Little Squirt" applicator and Dawson 73 if you have a large mill. Used in many leading mills. Cuts costs substantially. Two men can fumigate average mill in two hours. No equipment to buy. No initial investment.

DAWSON'S FORMULA 73 Specially prepared for Spot Fumigation in Mills, Bakeries, Breweries, Etc.

DAWSON LOW-DOSAGE FUMIGANTS

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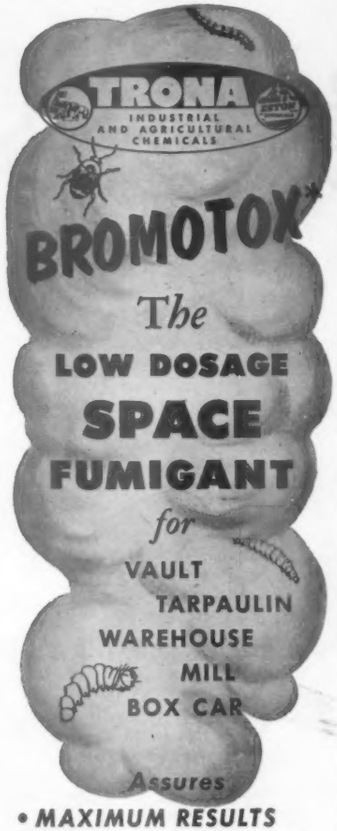

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- GREATER SAFETY
- MORE ECONOMY

Bromotox, a mixture of ethylene dibromide and methyl bromide, is an effective, safe and economical space fumigant. The stronger odor and lower dosage requirements of Bromotox result in greater killing power, increased economy and maximum safety. It is longer lasting, more penetrating and leaves no residual odor. Bromotox allows positive control of granary and rice weevils, Angoumois grain moth, confused flour beetle, Mediterranean flour moth, raisin moth, cheese mites and many other pests infesting grain, flour, rice, cheese and dried fruits. Available in cans packed twelve per case as well as 10, 50, 120 and 170 pound cylinders.

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The Versatile Fumigant

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Methyl Bromide with 2% Chloropicrin

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FERGUSON FUMIGANTS

810 S. FLORISSANT ROAD
FERGUSON 21, MISSOURI

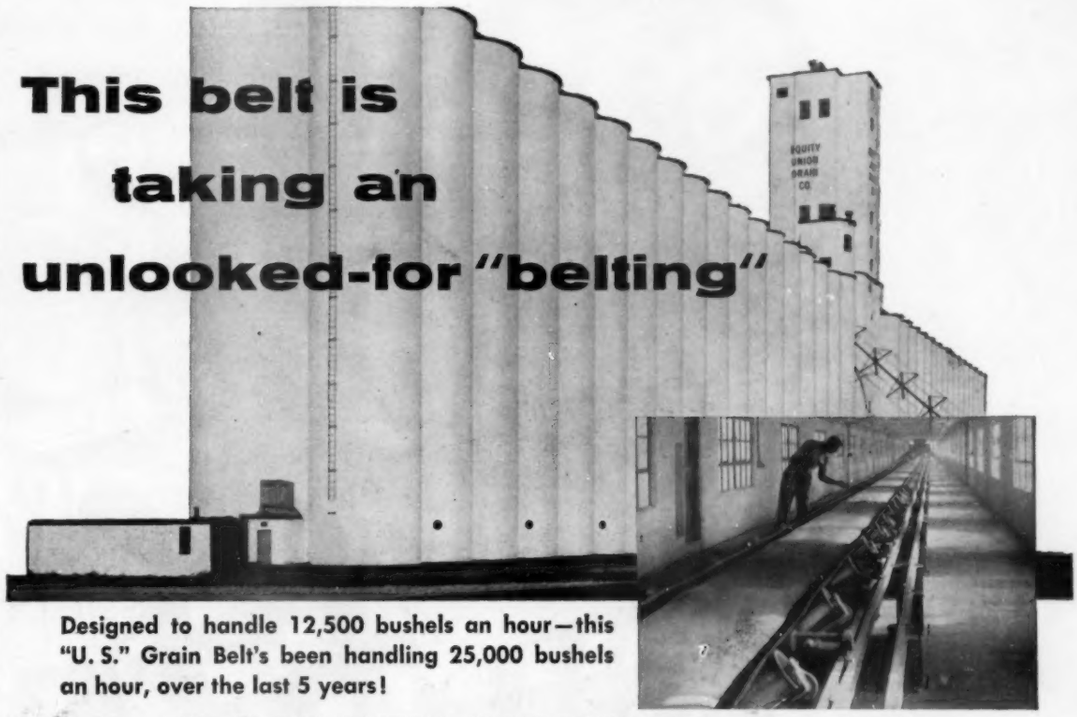
be overcome by specifying 3/16" pitch.

8. Occasional cleaning out of the accumulation of "crust," which forms inside the discharge flour outlet, might save a lot of trouble.

The Nordyke sifter reminds me of the DC-3 transport plane used by most of the airlines. They call it the "work horse" — well, the Nordyke sifter has been the work horse of the American milling industry. Just as the airlines are improving their equipment, so are the mill builders. Most Nordyke sifters with bronze sleeve bearings operate on a prescribed eccentricity of 4", and are called slow speed machines, while a small percentage of 2½" throw machines are in operation today. It is not a simple job to change a slow speed machine to high speed; it requires new driving irons and sometimes bearing trouble develops on these conversions.

Therefore, the free swing type machines with antifriction spherical roller bearings can be changed easily from slow speed of 4" to high speed of 2½", or any intermediate throw between these two points, simply by increasing the speed of the machine and decreasing the weights in the counterbalance box or by limiting the distance these counterbalances can move in their track. So in this respect this machine is more versatile.

In stacking a middlings section, many times it is helpful to split the throughs of the scalp and then split the flouring section below for better performance and higher capacity. In soft wheat mills or mills that grind both hard and soft wheat, it is desirable to remove the dustings and replace it with the second flouring section. If grinding hard wheat, have this second cut valved to the next middlings passage and when on soft



Designed to handle 12,500 bushels an hour—this "U. S." Grain Belt's been handling 25,000 bushels an hour, over the last 5 years!

This conveyor belt is installed in the elevator of Equity Union Grain Co., Lincoln, Nebraska. During the past 5 years, the belt has been carrying FOR PROLONGED PERIODS *twice the capacity* for which it was designed.

AND IN DOING THIS ABNORMAL, UNFORESEEN JOB, THE STRETCH HAS BEEN PRACTICALLY NEGLIGIBLE—A MERE .065%.

Self-propelled trippers used in loading the belt add to the severe operating conditions.

So pleased are the elevator officials with the performance of this great "U.S." belt, that they have already ordered additional "U.S." belting designed to DOUBLE the capacity of the elevator.

Advantages of "U.S." Cotton-Nylon Elevator Belting (over rayon belts)

- Needs no rubber covers in general leg service, as do rayon belts; cotton-nylon is *unaffected by moisture*, has far greater resistance to friction surface use.

(over ordinary duck)

- Greater strength permits thinner construction on heavy-duty legs. 7 plies can do the work of 11 plies of 42-oz. duck.
- High splice strength and resistance to bolt pull-through.
- Extremely low stretch. No need to cut or re-splice belt once it is in service.

Advantages of "U.S." Cotton-Nylon Conveyor Belts (over rayon belts)

- "U.S." cotton-nylon grain conveyor belts can be used without rubber covers (friction surface) for handling bags of grain on slider bed conveyors, because of high resistance to abrasion. Rayon will have shorter life in this service.

(over ordinary duck)

- Nylon filler provides excellent troughability, allowing true running when operating on 45-degree troughing idlers or over concentrator rolls.
- High fastener splice strength—*wet* or dry.
- High strength of cotton-nylon allows longer centers, higher capacities.

When planning new storage or belt replacements, specify money-saving "U.S." Grain Belts. Get in touch with any of the 27 "U.S." District Sales Offices or ask your own equipment concern or elevator builder.

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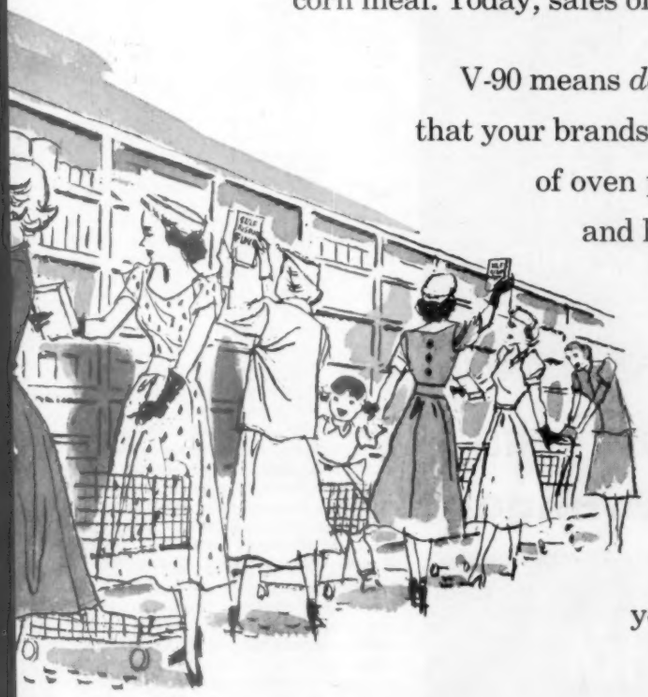
How to keep

the women happy!

These are the most important women in your life. They are *your* customers. Keeping their loyalty centered on your brand is just about your most important job.

For more than 16 years, you have been doing the right thing to keep them happy. How do we know? Because for more than 16 years, you (and practically every other family flour miller) have been using V-90 exclusively in self-rising flour and self-rising corn meal. Today, sales of both products continue to grow.



V-90 means *dependable* baking results. V-90 means that your brands can be counted upon to produce the kind of oven products that make women happy . . . and loyal to your brand. This, of course, is the reason for the milling industry's remarkable allegiance to V-90.

There is still another reason for the popularity of V-90. Here it is. *No one has ever succeeded in duplicating V-90!* That's worth remembering. It means you can be SURE with V-90. That's worth remembering, too!

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THE PHOSPHATE CRYSTAL WITH A "TAN COAT"*

V-90

*Coated Anhydrous Monocalcium Phosphate

wheat, use it as the second cut, thus increasing your bolting area on soft wheat and indirectly narrowing down the loss in capacity between soft and hard wheat.

Under miscellaneous we would recommend suctions on break passages, and if this is not practical, then a small amount of room air, of very low velocity, blown in directly with the stock to the sifter section. This is quite helpful on 4th and 5th break to keep down formation of certain types of mold on sides of sifter channels.

Another item which is quite helpful is the stenciling, shellacking, and varnishing of new sieve sections when new frames are bought. It is better to install a complete section at a time and then rebuild the salvageable sieves and re-install them in some other location.

The quarter twist drive is one of the hardest drives in the mill, unless you have each of your sifters motor driven. When using a flat leather belt, make the splice on the same side, then string your belt around your pulleys and let it follow the most natural course. For every two turns of the belt, the belt will turn once inside out, and when you lay it out on the floor, you will notice it will be straight and not in the form of a letter "S."

Sanitation

As to sanitation, it may be of interest to those who have old Nordyke sifters, with the bottoms screwed in with about 4 dozen screws, that the bottom can be and should be removable, the same as the sieves. It is almost a project, but when finished it pays dividends in greatly improved sanitation.

Sometimes we find sifter sox wired on with baling wire instead, held on by steel spring garters. The top of sifter sox next to the thimble can get infested, especially today when nylon sifter stockings last for years. This could not happen to stockings made from Canton flannel, because in a few weeks they were gone.

In summing up the sifter of today, we have several good machines made in the U.S. that can stand up in competition and be counted as the finest and most efficient sifters on the market today. Like any other machine a sifter requires nominal maintenance. We call it preventive maintenance, both from the miller's standpoint of sieve and silk maintenance, and also from the mechanical condition of the entire machine — drive and box. You can judge the general condition of the plant fairly well by looking at the condition of the sifter floor.

—BREAD IS THE STAFF OF LIFE—

Make sure of effective, economical insect and rodent control with AERO* LIQUID HCN, Fumigant

Experienced mill operators have found that the best fumigant for periodic destruction of hidden insects, insect eggs and rodents is AERO LIQUID HCN. When properly applied by an Industrial Fumigation Engineer, LIQUID HCN gives you plant-wide pest control in a matter of hours.

And LIQUID HCN has no injurious effect on grain and flour stocks. It leaves no taste or odor after proper aeration, and it does not affect the baking qualities of flour.

Consult your local Fumigation Engineer, or write us for the name of one near you.

Advantages:

- One of the most effective of all modern fumigants.
- One of the most economical of all modern fumigants.
- No dust or dirt.
- No residue problems; vaporizes completely.
- Largest cylinders empty in 5 to 10 minutes.
- HCN, being lighter than air, dissipates rapidly upon proper ventilation.
- Convenient. A mechanical operation conducted from outside the plant.

*Trade-mark

Other Cyanamid Products for Effective Pest Control

CYANOGAS® G-FUMIGANT . . . kills insects and insect eggs in stored grain.

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Write for fully descriptive literature.

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AMERICAN Cyanamid COMPANY
AGRICULTURAL CHEMICALS DIVISION
30-U Rockefeller Plaza, New York 20, N. Y.

Method of Antioxidant Addition Described

COLUMBUS, OHIO — Certain breakfast cereals, grains and other products have not fully benefited from the availability of modern food grade antioxidants even though these antioxidants have been specifically compounded to protect the fats and oils in these foods from oxidation and the resultant development of rancidity, food technologists were told recently.

Eastman Chemical Products, Inc., Kingsport, Tenn., a subsidiary of Eastman Kodak Co., believes it has the answer to the quality destroying problem involved with oxygen-sensitive foods such as dry breakfast cereals, processed grains and fried products. This was reported by Dr. Ben Stuckey, senior chemist of Eastman's food laboratories at Kingsport, in a paper presented before the Institute of Food Technologists in Columbus, Ohio.

Dr. Stuckey said virtually all food processing involves handling the product on one or more continuous conveyors. By providing a method whereby foods can be coated with solutions containing a "Tenox" antioxidant as they pass under an atomizer spray chamber, Eastman's method of antioxidant addition takes advantage of present processing methods, he said.

Dr. Stuckey presented experimental data showing the effectiveness of this method of addition in extending the shelf life of wheat germ meal, cream of corn, cream of oats, rice bran and other products. He said accelerated shelf life of wheat germ meal, for instance, was extended nine times in the tests.

He showed how the antioxidant could be sprayed in various media such as vegetable oil, food grade solvents or in a water emulsion. The amount of active antioxidant being applied to the food products, Dr. Stuckey said, is controlled by various means, including varying the speed of the conveyor, varying the concentration of the antioxidant in the spraying media, or varying the air pressure on the spray nozzle.

—BREAD IS THE STAFF OF LIFE—

ELEVATOR BEING ERECTED

SHIRLEY, ILL. — A 28,000-bu. elevator is being built by the Shirley Farmers Grain & Coal Co. and is expected to be complete by the time of soybean harvest, about Sept. 15. The 70-ft. elevator of eight bins will be topped by a 30-ft. cupola. Leg capacity will be 3,500 bu. hour according to LaRue Nevius, manager.

Buy and Sell Through WANT ADS

Changing Pattern of Capital Expenditures In the Feed Milling Industry

By V. J. Brensike and W. R. Askew

Agricultural Economists, U.S. Department of Agriculture

Table 1—Date of Plant Construction, or Last Major Remodeling or Addition to Plant, for Feed Mills in the Midwestern and Mid-Atlantic Regions

Tons of feed mixed per year	Number of plants during each period: Prior to 1925	1925-34	1935-44	1945-July 1, 1953	No reply	Total
	No.	No.	No.	No.	No.	No.
Under 5,000	2	1	4	14	5	26
5,000-14,999	1	2	2	8	1	14
15,000-34,999	1	0	3	5	4	13
35,000 and over	0	2	0	9	2	13
Total	4	5	9	36	12	66

EDITOR'S NOTE: It is well recognized that the efficiency of formula feed production has increased greatly in recent years, and this fact is pointed up in a new U.S. Department of Agriculture report on capital expenditures in the feed milling industry. Mill men interested in feed manufacturing will find the report, which appears here, of substantial interest. The findings indirectly illustrate the importance of plant improvement if a feed miller or manufacturer is to remain competitive. The report shows, among other things, the proportion of feed plants which have been modernized or have installed new equipment in recent years as compared with earlier years. It also helps show the importance and direction of some of the major capital outlays.

It required only 3 man-hours in feed-milling plants to produce a ton of feed in 1952 as contrasted to an average of 4 during 1947. This reduction appears to have resulted from a modernization of the feed mill buildings and the introduction of labor-saving machinery. This increased efficiency in the use of labor rather than an increase in the number of plants and the number of employees appears to have been the means of increasing the volume of feed produced by the industry since 1947.

More than half of the nation's feed milling plants have been built or have completed major additions or remodeling since 1945. About two thirds of them have purchased and installed new mixers and new grinders, and about three fourths have installed new pelleting machines during this period.

Increases of 88% in the hourly earnings of production employees, 67% in freight rates, and 5% in electricity, as well as increases in many other cost items, have encouraged this effort by industry to increase operating efficiency. Capital expenditures in plant and equipment are high enough, however, to require careful consideration of management before new capital replacements are initiated.

PROBLEM AND BACKGROUND—The milling and mixing of formula feeds has grown rapidly since 1927 when it was first reported as a separate industry by the Bureau of the Census. Early growth of the industry seems to have been characterized by a rapid expansion of the number of plants and the number of employees working in the industry. For example, the number of plants more than doubled between 1927 and 1935, and nearly tripled between 1935 and 1947.(1) The total number of employees working in the industry increased from about 11,000 in 1927 to about 55,000 in 1947, and the number of production and related workers increased from less than 8,000 to more than 40,000.

Output of the industry, as measured by the value of the products shipped, in 1947 was about seven times the 1927 level. When the value of the products shipped is deflated by an index of the price changes during the period, the result indicates that the physical output of the industry increased less between 1927 and 1947, than did the number of workers. Even considering the more complicated nature of the manufacturing process during recent times, and the probable reduction in hours worked per worker, industry averages appear to indicate that only a relatively small increase in output per man-hour had occurred in the feed milling industry from 1927 to 1947.

The feed milling industry has continued its rapid growth since 1947.

(Continued on page 17a)

YOUR CONTROL CHEMISTS APPRECIATE THESE ENRICHMENT ADVANTAGES

Control chemists recognize these points of superiority in MERCK VITAMIN MIXTURES:

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2. **All ingredients are so finely divided and thoroughly mixed that uniform distribution can be attained in every pound of flour.**
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Research and Production for the Nation's Health

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This reader service department announces the development of new and improved products, new services and new literature offered by manufacturers and suppliers. Claims made in this department are those of the firm concerned. Use the accompanying coupon to obtain the desired information.

No. 5243—Grain Sampler

The Burrows Equipment Co. offers a new grain sampler which is designed to be installed beneath the cleaner in the grain spout where the grain discharges. The company claims that it enables the operator to obtain a representative sample of corn or

other grain after it has been cleaned, and eliminates the need for climbing up to the cleaner to obtain a sample. A chain with handle extends down to the work floor and by pulling down on the chain the cup, which is turned sideways, is pulled into a vertical position and held there for a few seconds to obtain the sample. This sample then goes down through a small pipe to the work floor. The device can be used for checking the blend when loading out, or it can be installed in the head distributor for sampling small grain. Secure more complete details by checking No. 5243 on the coupon and mailing it.

No. 5250—Bag Closing Tape

A new aid to those who store or handle products normally contained in multiwall bags has been announced by the Chase Bag Co. The inventory aid is a smooth-finish tape in a wide variety of colors, which is sewn across the bottoms of multiwall bags as a "closing" tape. In the case of sewn valve multiwall bags, closing tapes are used on both tops and bottoms of bags. The new colored tape, called "Flattertape," is said to serve as a ready identification of the bag contents when bags are stacked and the printed surface of the bag is not visible. Other advantages claimed are the improved printing surface and the availability of colored inks to contrast with the tape. Natural kraft tape is also available in the same texture. The new tapes will be available for all customers who prefer them to the usual crepe-type tapes. It was announced that the tapes will lower cost to the user. For more complete details check No. 5250 on the coupon and mail it to this publication.

No. 5218—Sump Pump

A new sump pump with a totally enclosed motor has been devised for use in grain and milling plants by Kenco, Inc. Called the Kenco model 109A, it is equipped with stainless and steel armored cable and it is widely used for sumps, elevator and silo pits, boiler room pits, loading docks, basement and other low spots. The motor operates in an air-tight, leak-proof hermetically sealed case. The motor case is filled with oil and the motor is actuated by a no-float, two stage liquid level control mechanism which has no moving parts exposed to water. The company claims that these features reduce the fire hazard to an absolute minimum. The protective steel cable guards against rodent damages. The pump and mo-

Send me information on the items marked:

- ☐ No. 5243—Grain Sampler
- ☐ No. 5250—Bag Closing Tape
- ☐ No. 5218—Sump Pump
- ☐ No. 6163—Mask, Dust Filter
- ☐ No. 5210—Bag Handling Paster

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SLIP OUT—FOLD OVER ON THIS LINE—FASTEN (STAPLE, TAPE, GLUE)—MAIL

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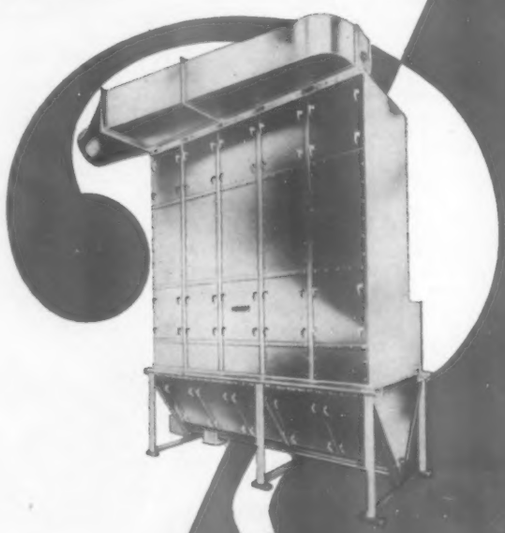
"DO-IT-YOURSELF" or "TURN-KEY" job ? ? ?

an ENTOLETER DIVISION designed system solves dust collection problems either way . . .

Our engineering staff will specify the Simon Suction Filter Dust Collector to meet your mill requirements . . . ship you the parts and installation instructions and you can "DO-IT-YOURSELF"! All parts are jig-drilled and tapped to facilitate assembly . . . or dismantling should future requirements dictate its relocation.



OR. . .

Our engineering staff will design a "turn-key" dust collecting system incorporating a Simon Suction Filter Dust Collector, tailored to your specific requirements . . . contract and supervise its complete installation . . . relieving you of all details until it's time to pull the "ON" switch.

Regardless of which method solves your dust collecting problem . . . the all aluminum SIMON SUCTION FILTER DUST COLLECTOR is the answer. It has been redesigned and streamlined to keep in step with modern milling practices . . . contains the greatest filtering area per square foot of floor space . . . operates with high air to cloth ratios . . . delivers air free . . . low power requirements . . . IT IS YOUR BEST BUY IN DUST COLLECTING EQUIPMENT!

ENTOLETER DIVISION
The Safety Car Heating & Lighting Company, Inc.
1187 Dixwell Ave., New Haven 4, Connecticut

tor are housed in a single case 11⅛ in. high and weigh 45 lb. A 1½-in. vertical discharge port permits straight discharge connection. The ⅓ H.P., 1,725 r.p.m. split phase type motor is directly coupled to an open-faced impeller protected by a bronze screen. The pump has a capacity of 3,300 GPH. Secure more complete details by checking No. 5218 on the coupon and mailing it.

No. 6163—Mask, Dust Filter

A light protective mask which weighs less than ½ oz. has been announced by the General Scientific Equipment Co. Made of soft rolled

aluminum, it is said to be so pliable that it fits any shape face. It is recommended for protection against ordinary non-toxic dusts and spray hazards and may be worn with goggles. No metal touches the skin. Filter discoloration, caused by dust, is indicated in the picture. For more complete details check No. 6163 on the coupon and mail it to this publication.

No. 5210—Bag Handling Poster

A poster designed to curb careless handling of multiwall paper bags has been prepared by the Fulton Bag & Cotton Mills. The poster, printed in red and black, is designed for use on bulletin boards and in other plant areas. Cartoon technique is used in the illustrations and the text is brief and to-the-point. The poster may be obtained by checking No. 5210 on the coupon and mailing it to this newspaper.

CAPITAL EXPENDITURES

(Continued from page 15a)

Industry output, as measured by the tons of commercial feeds produced, was nearly a third higher in 1952 than it was in 1947. Contrary to the earlier growth, this recent growth does not appear to be explained by increases in the number of establishments and the number of employees. Estimates from the "Annual Survey of Manufactures" (2) indicate that the size of the labor force engaged in production increased only 1%, while the average annual man-hours worked by each production worker decreased slightly.

This indicates that if any material increase occurred in the number of establishments, the number of workers employed in each plant must have decreased. Even more important, however, is the fact that most of the 31% increase in tons produced appears to have come from an increase in the output per man-hour of the workers employed in feed-mixing establishments.

Estimates based on the "Annual Survey of Manufactures" (3) indicate that while it required, on the average, about 4.2 man-hours to produce a ton of formula feed in 1947, it required only about 3.2 man-hours in 1952. This increased efficiency of labor used in the feed milling industry is even more notable when the changes in final products are considered.

Not only has the older tendency toward an ever increasing variety of finished and specialty feeds continued but the gradually expanding number of ingredients used has been increased during this period by the almost universal adoption of the use of minor ingredients, especially antibiotics and vitamin B_{12}. All of these changes in the final product have tended to increase the number of starts and stops, and the use of minor ingredients in grams and milligrams per ton all have tended to increase the cost of production.

Analysis of operating costs and efforts to increase operating efficiency have undoubtedly been spurred on by the increases in the cost of most

Table 2—Date of Purchase and Installation of Last New Feed Mixing Machines, U.S.

Tons of feed mixed per year	Number of plants during each period: Prior to 1925	1925-34	1935-44	1945-July 1, 1953	No reply	Total
	No.	No.	No.	No.	No.	No.
Under 5,000	0	1	11	25	6	43
5,000-14,999	0	3	9	19	4	35
15,000-34,999	0	0	7	12	2	21
35,000 and over	0	1	5	17	4	27
Total	0	5	32	73	16	126

In 1903 the Wright Brothers, at Kitty Hawk, North Carolina, made the first successful flight in a powered, heavier-than-air machine.

Countless hours of hopes, calculations and experiments found expression in this brief hop, prelude to the mighty air armadas, civilian and military, we see today.

SWISS SILK is also the product of untold hours of research and development. Our laboratories are constantly checking, inspecting and seeking new avenues of service to any industry using a vital sifting operation.

SWISS SILK is the world's best sifting textile and millers everywhere give it first preference.

SPECIFY THESE BRANDS FOR GENUINE

Swiss Silk

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Table 3—Date of Purchase and Installation of Last New Grinding Machine, U.S.

Tons of feed mixed per year	Number of plants during each period: Prior to 1925	1925-34	1935-44	1945-July 1, 1953	No reply	Total
	No.	No.	No.	No.	No.	No.
Under 5,000	2	1	11	20	9	43
5,000-14,999	1	0	12	16	6	35
15,000-34,999	0	0	3	15	3	21
35,000 and over	0	0	6	14	7	27
Total	3	1	32	65	25	126

items required in the manufacturing of formula feeds. Since 1945, freight rates (4) have increased about 67%, electricity costs (5) 5%, and hourly wages of production workers employed in feed mills (6) have increased 88%. Each of these items are important elements in the production of formula feeds. Labor costs, for example, account for about 58% of the total costs of operating feed mixing plants. (7) Apparently the industry has been quite effective in increasing labor efficiency since the annual census of manufactures indicates only a 7% increase in the labor cost per ton of feed produced between 1947 and 1952. Hourly wages increased 41% during the same period.

One of the reasons for this increased efficiency in the use of labor is that capital is being used in the industry to install labor-saving equipment and redesign plants to yield a higher output per man-hour. While no complete information is available on capital outlays, a recent survey (8) indicates that this development has been under way in the feed milling industry. In the course of the survey, data were accumulated on the age of plants and the extent and timing of the most recent additions to plant and equipment. These data show the importance and direction of some of the major capital outlays. Some of the highlights relating to capital outlays are summarized in the following paragraphs.

METHODOLOGY (9)—This report is based on information obtained in the survey of the costs of operating feed milling establishments. As a result, the survey was not designed specifically to analyze the shifting use of capital expenditures in the industry.

Thus the term, cooperating plants, as used in this report pertains to plants cooperating in the "cost" study and they may or may not have supplied data on the age of plant and the extent and timing of the most recent additions to plant and equipment. Also, since one of the primary purposes of the original study was to contrast operating costs in plants of different volumes, the sample drew larger plants at a greater sampling rate. In view of this fact, the present analysis will also be more accurate if the analysis is made on the basis of operating volume group averages rather than on the basis of an overall industry average.

The original survey covered the operation of 126 feed mixing plants operating in the middle Atlantic, southern, midwest, and Pacific regions of the U.S. Sample and alternate plants were chosen at random within volume and geographic location strata. Between 22 and 35 plants cooperated in each of these regions and were quite evenly distributed within each region over the operating volume area of from 1,000 to over 100,000 tons of feed mixed per year.

PROPORTION OF PLANTS MODERNIZING

Plants and buildings—Capital expenditures on plants and equipment have continued at a high level since 1945. On the basis of the survey it is estimated that more than half of the existing feed mill plants have been built or have completed major additions or remodeling during the period Jan. 1, 1945, to July 1, 1953.

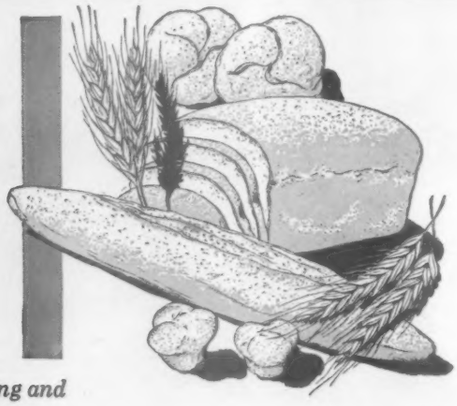
In the middle Atlantic and midwest areas, 58% of the cooperating firms indicated that they have built their plants or have completed major additions or major remodeling since 1945 (Table 1). When those establishments which did not reply are excluded, this percentage increases to 68%. As is indicated in Table 1, this rapid modernization of feed mill plants seems to have occurred at about the same pace in feed mills of all sizes. These percentages are large enough in recent years to be worth noting even though it is recognized that a question of this type will nearly always result in heavier replies during recent periods.

Although fewer of the cooperating plant owners and operators supplied information on the age of plants and dates of later major capital outlays on plants and buildings in other areas of the country, over half of them also appear to have made major capital expenditures on plants during the same period. (10)

Feed mixers—All feed mills have one or more machines to mix the ingredients into the finished feed. Most mills, especially the small- and medium-size plants, use batch mixers. However, nearly half of the larger mills used the line or combination line-batch process. (11) Each of these methods appears to have proved itself and has specific points in its favor for particular types of operations.

From the standpoint of capital expenditure and efficiency of operation the date of installation is quite im-

FLOUR FOR MAN'S BREAD*



A Brief History of Milling and Baking by SCIENCE WRITER

CHAPTER IX. *Milling in the Early American Colonies*

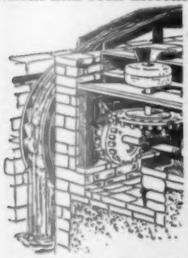
EARLY AMERICAN GRAIN CULTURE

When the earliest settlers came to what is now the United States they found a dense wilderness sparsely occupied by Indians who depended on fishing and a nomadic agriculture practiced in small openings in the forest.

Corn, or maize, was the staple grain of the Indians, and of the early settlers. It was as important to them as wheat, barley or rye were to the Europeans. Wheat was soon imported and grown by the colonists.

The Indians had a practice totally different from European grain culture. They cultivated a small area around each corn hill. In the Old World it was the custom to scatter the wheat berry, barley and rye on the fields and let the grain fight it out with the weeds. The Indian cultivation was done with crude tools.

Seeing the advantages to be gained by this method the earliest New England colonists imported work animals from the home country and put them to the job of plowing and tillage. Apparently the results were satisfactory because crops of wheat and corn increased abundantly.



GRAIN SUPPLY REQUIRES MILLS

With the increase in grain supplies it was necessary to found grist mills. These were probably post-mills powered by the wind, a type easier to build than the watermill. The latter soon took over, however, as the terrain of the Eastern United States is especially suitable.

We should remember that commercial milling appeared early in colonial life because grain must always be ground to make a suitable product for human consumption. The whole wheat-berry is no fare for human beings.

GRIST MILLS—THE COMMUNITY CENTER

The mill soon became a community hub. Local farmers within a day's traveling time brought their grain to the mill for grinding and took the resulting meal for use at home. They paid the miller a toll, or share of the meal. Because of the traffic at the mill it soon became a meeting place for the exchange of ideas and gossip.

Wheat became a most important crop in New York, Pennsylvania, Maryland and on into the Middle West. New York City, Philadelphia, Baltimore, Richmond and Wilmington became major milling centers. Milling and traffic in grain played important parts in the phenomenal growth of New York and Philadelphia, as we shall see in our next chapter.

HOW WHITE FLOUR AND BREAD ARE MADE BETTER

Giant strides have been made in U. S. milling during the past 250 years. Today we have the fine white flour and bread of a quality beyond the dreams of colonial millers and bakers.

During the past 50 years or so many basic discoveries have been made about the elements composing our foods.

These two facts are related in this way. In the examination of food factors it was found that essential vitamin and mineral losses unavoidably occur in the production of the white flour so much in demand by today's consumers. When this became known millers of family white flour and bakers of white bread acted in the public interest. They enriched their good products with the vitamins thiamine, riboflavin, niacin and the mineral, iron to restore the inescapable losses of these vital factors. By thus making their good foods better they contributed to better health for all Americans.

This is one of a series of articles which is being published in professional nutrition and dietetic journals, and which will be widely distributed for educational purposes. Reprints of this and all previous chapters are available without charge. Write to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

The next chapter titled: "When New York and Philadelphia Were Milling Capitals" will be published soon.

*This is the title of a definitive history of milling by John Storck and Walter Dorwin Teague, published by the University of Minnesota Press at Minneapolis and copyrighted by the University of Minnesota. It is used with permission as a source of material for this series of advertisements.

***Enriched with vitamins and iron for better nutrition**

portant, especially since many of the purchases signify expansion through an additional production line, or an attempt to attain increased efficiency from the new machine itself or through a slightly changed, ingredient- and product-flow design. Less man-hours may be required per ton produced, even when the purchase was made for an added production line, since the line itself may be relatively more efficient and the number of starts and stops may be eliminated or greatly reduced on one of the production lines.

Grinders—Nearly two thirds of the plants for which information was supplied on the most recent purchase of a new grinder, indicated they had purchased a new grinder during the period Jan. 1, 1945, to July 1, 1953. Even if the "no reply" plants are considered as having old grinders, more than half of the plants purchased and installed new grinders during the same period (Table 3).

Pelleting machines — Pelleting of animal feeds is a relatively new service supplied by the feed milling industry. Very little pelleting was performed prior to World War II. In view of this fact, the purchase and installation of pelleting machines must be looked upon quite differently than the use of a new feed mixer or grinder. In the case of the latter machines, the new machines and possibly new flow patterns are merely doing the same job in a potentially more efficient manner. In the case of pelleting machines they are performing a new operation and supplying a new service for the feeders. As a result, their purchase and installation signal a tendency to increase the use of labor per ton of feed produced at the same time the capital expenditures increase.

Capital invested in plant and equipment—Capital investment in feed mill plant and equipment is high even for companies and individuals who enter the industry on a small scale. Capital investment in plant and equipment ranged from $24,000 to $150,000 in those plants mixing less than 5,000 tons per year. The median plant in this volume group had an investment of $48,000. Twenty-eight thousand dollars of this investment was in the plant itself and $20,000 in machinery and equipment (Table 5). Concerns mixing about 20,000 tons per year had an investment of about $200,000, and those mixing 40,000 tons per year about $300,000. Some of the largest companies had investments of over $2 million in a single plant and its equipment.

It is interesting to note that the median capital investments for equipment in the volume groups mixing 15,000-24,999, 25,000-34,999, and 35,000-44,999 tons of feed per year amounted to between $100,000 and $110,000. This indicates a tendency toward less efficient use of machinery and equipment in the smaller volume plants. The analysis of operating costs (13) indicates that this tendency carries through the entire range of operating volumes analyzed.

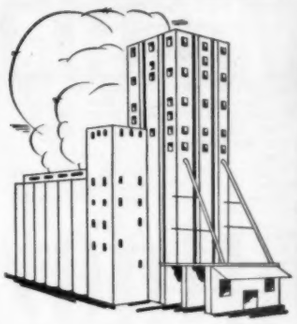
Operating volume when expressed as a proportion of capacity tends to decrease as the operating volumes of the plants decrease. In this instance, it appears that either (1) a certain capital expenditure is required for equipment to produce about 20,000 tons per year and that this output can almost be doubled with the existing equipment, or (2) many plants have been constructed for a potential market of about 40,000 tons per year but have not as yet been able to achieve this objective.

These capital investments in plant and equipment are based on the information on original investments as reported by 64 companies located in the Pacific, midwestern, southern, and middle Atlantic areas of the U.S. Replacement costs would, of course, be even higher. An analysis of the costs of operating feed milling establishments indicates that when raw material costs and profits are excluded, depreciation accounts for about 9% of the total costs of operation in plants mixing less than 5,000 tons per year. (14)

The proportion of total costs represented by depreciation decreases gradually as the plant volume increases, but it still represents about 5.5% of the total costs in plants mixing 45,000 tons or more per year. This is a sizeable proportion of total costs and indicates the need for careful deliberation by management be-

Table 4—Date of Purchase and Installation of Last New Pelleting Machine, U.S.

Tons of feed mixed per year	Number of plants during each period: Prior to 1925 No.	1925-34 No.	1935-44 No.	1945-July 1, 1953 No.	Have no pelleting machines No.	No reply No.	Total No.
Under 5,000	0	0	1	4	37	1	43
5,000-14,999	0	0	3	16	11	5	35
15,000-34,999	0	0	1	16	1	3	21
35,000 and over	0	0	2	19	2	4	27
Total	0	0	7	55	51	13	126



WHEN YOU THINK OF COST THINK OF UNIT COST

Let's face it—gallon for gallon Weevil-Cide costs more than most other grain fumigants. There are reasons for this, but they aren't of primary interest to the purchaser. It is enough to say that Weevil-Cide is sold on as close a margin as other grain fumigants.

What does interest you is, "Why, if Weevil-Cide costs more, do you say I can use it as cheap as any and cheaper than most?"

You'll find the gimmick under the heading "Dosages" on the labels of most liquid fumigants. Usual dosage recommendations are 2 to 4 gallons per thousand bushels **plus twice this amount for both the first and last drafts.** Weevil-Cide dosages are clearly stated, according to bin structure and size. For a medium concrete bin (5,000 to 20,000 bushels) the dosage is 1½ gallons per thousand bushels —no extra dosage necessary.

Hence, the real story is **unit cost.** Unit cost provides the simple answer to: "How much does it cost me to treat a thousand bushels of grain **under the conditions in my elevator?"** The factors controlling unit cost are the delivered cost of the fumigant and the dosage required to obtain results in **your** bins—including any extra dosage recommended.

The way to calculate unit cost is to multiply recommended dosage by the delivered cost of the fumigant, like this:

Basic dosage plus any extra dosage X Delivered cost of fumigant = UNIT COST

Now let's see how this method works in actual practice. We'll supply some actual figures for this example, but you can fill in the dosages and prices that apply at your elevator and see how you come out.

The highest price in 53-gallon drums for Weevil-Cide is $1.95 per gallon **F.O.B. Kansas City.** For freight we picked the rate to Richmond, Virginia, because of its relatively great distance from Kansas City. This freight amounts to 35c per gallon. This would make **delivered cost** for Weevil-Cide to Richmond $2.30 per gallon. By contrast, many competitive fumigants sell in less - than - truckload amounts for **$1.80 delivered.**

For this comparison we've taken a 16,000-bushel concrete bin. For the competitive fumigant we've used a dosage of 2 gallons per **thousand bushels plus 2 gallons each for the** first and last 500 bushels as recommended. For Weevil-Cide we've taken our recommended dosage of 1½ gallons per thousand bushels.

Competitive Fumigant		Weevil-Cide
16	Thousand bushels in bin	16
2	Gallons per thousand bushels	1.5
32		24
4	Plus extra dosage	0
36	Total recommended gallons	24
$1.80	Delivered cost of fumigant	$2.30
$64.80	Total cost for bin	$55.20

You have savings of $9.60 on the fumigation of the bin with Weevil-Cide. **Even if you had decided not to use the 4 gallons extra dosage recommended with the competitive fumigant, your cost would still be $2.40 higher than with Weevil-Cide.**

Weevil-Cide The DEPENDABLE GRAIN FUMIGANT

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Table 5—Capital Invested in Plant and Equipment by Volume Groups, U.S., 1953

Tons of feed mixed per year	No. of plants supplying data	Capital invested in feed mill and equipment: Feed mill plant and equipment Range	Median plant	Plant*	Equipment*
	No.	$1,000	$1,000	$1,000	$1,000
Under 5,000†	13	24– 150	85	28	20
5,000-14,999†	15	56– 250	92	51	41
15,000-24,999†	5	125– 278	217	117	100
25,000-34,999†	4	119– 550	219	118	101
35,000-44,999	7	126– 659	261	151	110
45,000 and over‡	12	441–2,243	843	514	329

*Based on group average proportions of total.
†One company rented plant or plant and equipment.
‡A number of plants mixed over 100,000 tons of feed per year.

fore deciding to initiate new capital investment. High repair costs and obsolescence must be kept in mind, as well as relative machine efficiencies, relationship of labor and depreciation costs, and feeder demand for pellets, bulk delivery, and other new or potential services.

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(1) 1947 Census of Manufactures, Grain Mill Products, MC20D and Mktg. Res. Rept. No. 35, "The Mixed-Feeds Industry," William R. Askew and V. John Brensike.
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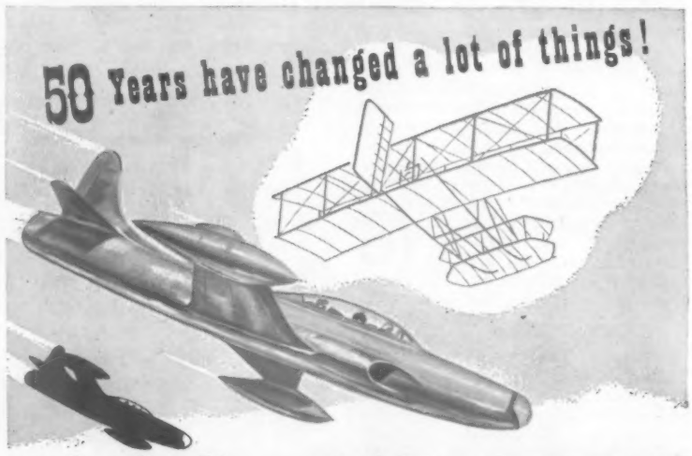
(7) V. J. Brensike and W. R. Askew, Costs of Operating Selected Feed Mills, Mktg. Res. Rept. No. 79, February, 1955. USDA, Washington, D.C., p. 45.
(8) Ibid.
(9) Ibid.
(10) For the U.S. as a whole, two thirds of the cooperating firms supplied data on the age of plants and recency of major plant expenditures. Sixty per cent of those supplying data of this sort made major capital expenditures on their plants during the period Jan. 1, 1946, to July 1, 1953.
(11) V. J. Brensike and W. R. Askew, Op. Cit.
(12) V. J. Brensike and W. R. Askew, Op. Cit.
(13) Ibid.
(14) Ibid.

YIELD OF FLOUR

(Continued from page 1a)

cases. Wheat No. 3 has a relatively low ash, and the flour milled from it is correspondingly low in ash content. Wheat No. 9 has the highest ash, and the flour milled from it shows the highest ash content of any of the flours listed. This confirms what is accepted as a general rule, namely that fluctuations in the ash content of the flour follow more or less closely the variation in the ash content of the wheat being milled. The only exception to the rule appears with wheat No. 2, which is probably caused by some irregularity in proceeding



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Cutaway view of the DAY Dust Filter —available housed or unhoused—for use on either vacuum or pressure. (Licensed by H. J. Hersey, Jr.)

Man's accomplishments in 50 years have been spectacular. Compare the 3 hour and 46 minute non-stop transcontinental flight made March 9th, 1955, with the 12 second flight by the Wright Brothers in 1903.

Striking progress in dust control equipment has also been made. The DAY "AC" Dust Filter, made under DAY and Hersey patents, is the *modern* filter to match *modern* methods. It handles up to *five* times more dust laden air per square foot of cloth area than out-moded conventional type filters. Filter tubes are cleaned *automatically* and *continuously*. At the same time this modern DAY Filter requires one-third less plant space.

17 GENERAL MILLS PLANTS EQUIPPED WITH DAY DUST CONTROL

One of the primary reasons for the selection of DAY Dust Control by so many of the leading flour mills is the DAY "AC" Filter. This filter is the "heart" of the DAY dust control system and provides such modern advantages as square-to-round air inlets, multiple screw conveyor discharges, high air-to-cloth ratios and high pressure reverse jet, self-adjusting cleaning rings. For an economical and effective solution to your dust problem write toDAY for Bulletin 528R.

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with the tests or by some other methodical error.

A similar parallel exists between bran coat component and flour ash; the wheats with low bran coat component figures yielding flour of low ash while those with the higher bran coat component producing flours of relatively higher ash. Applied to practical mill operation, this means that wheats testing low in the matter of bran coat component are capable of being milled to a higher per cent of flour extraction than wheats which are found to test high in this respect. However, in contrast to the ease and accuracy of ash determination, the amount of work and probability of irregularity and error are considerably greater in connection with determinations of bran coat component. The method at this time commonly employed presents certain difficulties which are due to the subjective handling of both the washing operation and the collection of the bran particles.

No Consistent Relation

The three remaining quality characteristics, test weight, 1,000-kernel weight and specific weight, fail to show any consistent relation either to wheat ash and bran coat component or to flour ash, and their distribution does not permit a recognizable pattern of regularity. Our experiments along this line of work tend to substantiate the claims established by others engaged in this type of research to the effect that test weight, 1,000-kernel weight and specific weight are of doubtful value for the purpose of estimating prospective flour yield of any given parcel of wheat. On the other hand, determinations of bran coat component and of ash content of the whole grain provide data which has been proven useful and valuable for that purpose.

Accordingly, bran coat component and ash content of the whole grain appear as decisive factors affecting the flour yield potentiality of milling wheat. This claim is further substantiated by a computation of the respective correlation coefficients. For this purpose the "linear correlation calculation" as demonstrated by Schaefer and Flechsig was employed. By this method a correlation coefficient is obtained which expresses to what extent a relation between two magnitudes is present. Correlation coefficients of plus 1 or minus 1 indicate immediate and direct relation; coefficients of between 1 and 0.5 indicate a relation ranging from good to satisfactory, while below 0.5 no relation can as a general rule be established.

As appearing in Table 3, correlation coefficients of plus 0.889 and plus 0.774, respectively, were established for whole grain ash and bran coat component. The relation of both these grain quality characteristics to the flour ash, and thereby indirectly to the potential flour yield, is good. Test weight, 1,000-kernel weight and specific weight, on the other hand, do not exhibit any recognizable degree of correlation to the flour ash. Other grain quality factors which we had determined in the course of this work, as for instance thickness of bran coat, average kernel size and hardness of endosperm, all of which we have felt justified in omitting from the tables presented in this article, likewise failed to exhibit any orderly relation to flour ash.

The authors feel that the tests herein recorded demonstrate the practicability of predicting prospective flour yields with a fair degree of accuracy from the results of tests regularly performed within the scope of operation of the average mill laboratory. These determinations will become valuable only as the portrayal of the difference between theoretically possible and actually obtained flour yield will lead to a narrowing of the spread between these two in practical flour mill operation.

Not the least of the factors which determine the profitability of flour mill operation is the fullest possible utilization of the raw material, wheat. And because the quality of this raw material is by nature variable, its processing requires constant and diligent control. Regrettably, attentiveness slackens in many cases when things seem to go well and is regained only after difficulties have already arisen. The author of another article dealing with the subject of flour yields is entirely correct in stating "as long as the miller is able to get his accustomed yield, he will have little incentive for exploring possibilities of yield improvement. It is a different story when he has to search for his missing flour per cents." It is, of course, true that flour yield depends first of all on what is in the

TABLE 3—Correlation between ash content of flours and various grain quality characteristics.

	Wheat ash	Bran coat component	Test Weight	Spec. Weight	1,000-kernel Weight
Coefficient	+0.889	+0.774	0.013	0.012	0.097
Probable discrepancy	0.047	0.089	....	....	....

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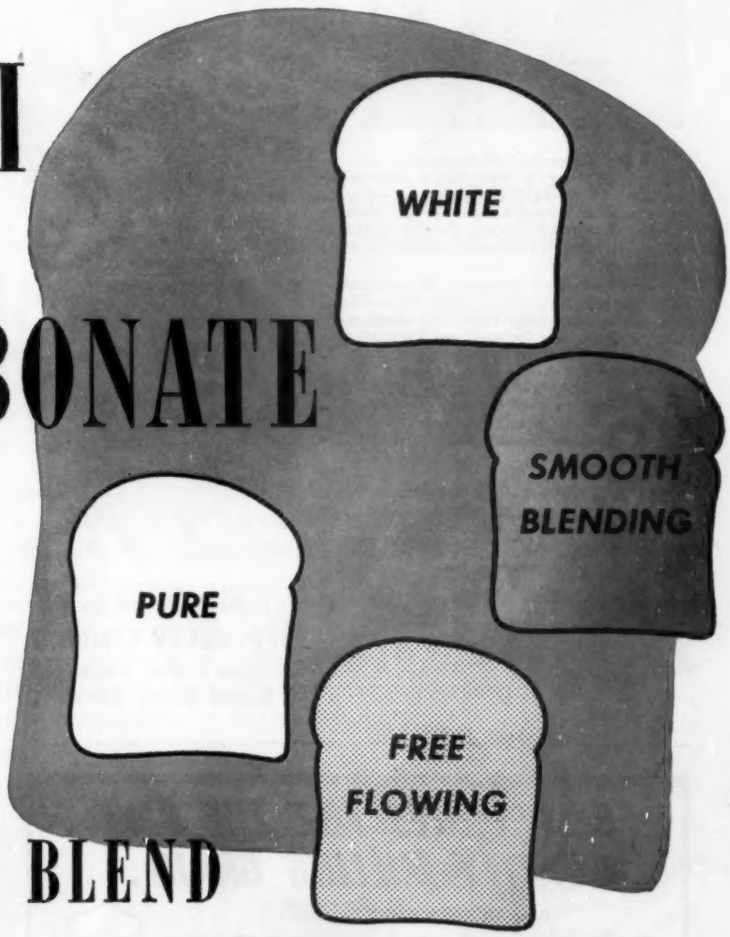
SODIUM BICARBONATE



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Columbia-Southern Flour Blend is a product of high purity, white, free-flowing for smooth-blending—to give you consistently high quality results.

Columbia-Southern "bicarb" is made in a variety of uniform screen sizes to blend just right with your self-rising flours. It is a specially prepared mix of U.S.P. Sodium Bicarbonate and U.S.P. Tri-Calcium Phosphate.

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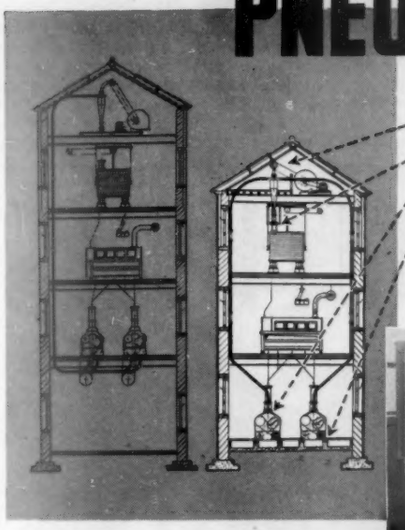


SPACE-SAVING reducing capital expenditure.

CYCLONES mounted directly on to plansifter feed-boards.

MINIMUM LIFT — Stock is lifted vertically through rollermills.

A STRAIGHT FLOW from hopper allows basement-fitted rollermills.

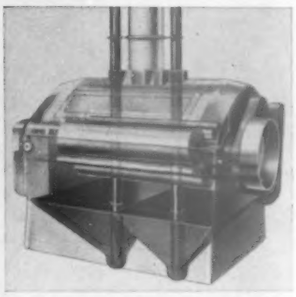
A typical layout of Robinson Receiver Aspirators—Type PFm

Look for these five all-important factors when choosing a pneumatic conveying system 1—overall efficiency, 2—power consumption, 3—freedom from chokes, 4—simplicity of layout, 5—the space it occupies, plus freedom of access to vital machinery.

'Pneu-Flow' was designed to withstand this searching scrutiny. Only 'Pneu-Flow' offers the advantage of lifting stock vertically from the hopper, up through the rollermill. New minimum lift of stock saves power. Absence of vicious bends makes hold-ups a thing of the past. Yes, 'Pneu-Flow' is choke-proof. Better still, 'Pneu-Flow' is available, versatile, sanitary, adaptable to *any* mill or smut department.

SAVING POWER AND SPACE

Compare the savings with the outmoded, conventional layout, left. See how bends are smoothed out—even avoided. Notice, too, how the vertical lift is cut down. 'Pneu-Flow' reduces building heights and power consumption.



A "ghosted" rollermill showing the vertical lift from the hoppers.

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grain, but it is sufficiently important to justify efforts to determine how much that really is.

Because of the variable quality of the grain delivered to mill elevators, which naturally introduces an element of uncertainty, quality evaluation should never be restricted to consideration of a single quality factor. For the purpose of counter control two or more quality factors should be determined which will reduce the chances for accidentally obtained faulty conclusions.

While ash testing of flour has become a generally accepted practice, the determination of the ash content of the wheat being milled is not widely practiced. Yet, it is exactly the latter which determines yield potentiality when milling for flour grades of definite ash content. This claim appears to be substantially proven by the tests reported in this article and which essentially agree with the findings of other research workers who have explored this problem.

Similar claims can in this connection be made for the importance of the bran coat component which is the determinant of the absolute flour or endosperm content of the whole grain. However, at the present stage this test is rather difficult to perform and requires an incomparably longer time than the ash test. Although several short methods of testing for bran coat component have been described in the trade literature, it is evident that up to now no really practical method has been developed. It is to be ardently hoped that a suitable method may soon be made available which will enable millers to estimate the potential flour yield on the basis of an accurate determination of the bran coat component of the wheat.

New Application Methods
make Positive Pest Control Still Easier with Larvacide

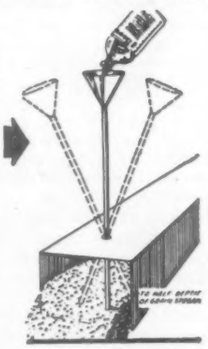
Granary and rice weevil, bran bugs, Lesser Grain Borer, Saw Tooth Beetle, Angoumis Moth... are some of the insect pests LARVACIDE can wipe off your trouble list. LARVACIDE's kill includes egglife and larvae and LARVACIDE penetrates grain kernels to kill bugs seeking free board inside.

RECEIVING or TURNING — Larvacide Grain Stream Treatment prevents unwelcome guests free boarding on your grain. Larvacide permeates the grain mass, does its work and aerates.

FLAT STORAGE — Use Larvacide Probe Method: 5' lengths of ½" pipe, perforated at 6" intervals. Make application when withdrawing probe. *For details, write for Data Sheet No. 4.*

SPACE and SACKED GRAIN—AEROSOL LARVACIDE releases the powerful, penetrating gas at a turn of a valve. Spreads instantly. Takes less time to fumigate and less time to aerate.

RODENTS—Your grain fumigation above helps keep rodents out of premises. Space fumigation brings rats out to die on open floor. No carcass nuisance. Burrow treatment kills rats and prevents rehabitation of burrows.



LARVACIDE GRAIN Stream Treatment

Introduce LARVACIDE into tripper spout by pouring through homemade funnel pipe, rocking from side to side while pouring.

LARVACIDE Wick Bottle

RODENT REPELLENT IN WAREHOUSE — Use Larvacide Wick Bottle. Insert soft string into bottle, letting part hang outside as wick. Replace cap. Use one bottle for each 500-800 square feet of space. *Write for Bulletin No. 1004.*

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During December when rats drive indoors for food, by placing bottles at strategic points in warehouse of 4,000 sq. ft., the building was kept free of rodent entry . . . at a cost of approximately $12.

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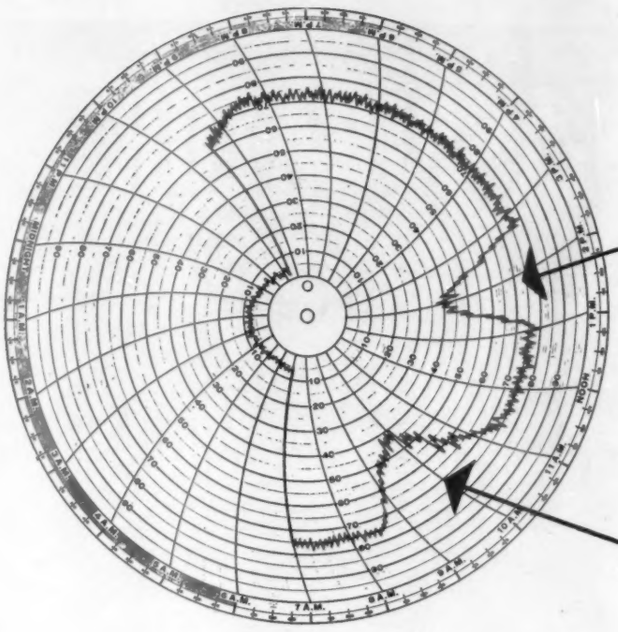


these mean trouble...

IT MIGHT BE a broken belt, a torn sieve, or a choke-up somewhere in the spouting.

But... no matter *what* causes the flow variation in the flour stream ... it's spotted the INSTANT it happens. One look at the graphic recorder operated from the W&T Massometer or Merchen Scale Meter tells the story. Even the smallest momentary fluctuations in flow rate are detected immediately and recorded accurately by these mill "watch dogs."

W&T Massometers and Merchen Scale Meters provide a continuous record — *by weight* — of actual mill performance. They tell you the *exact* flow rate of your streams and they pinpoint time and production losses.

Guaranteed to 1% accuracy, the Massometer will handle flour flows up to 200 pounds per minute... the Merchen Scale Meter, up to 600 pounds per minute. For other applications the Meter will handle flows up to 3000 pounds per minute. Both instruments have been tested and proved highly dependable in hundreds of installations throughout the country.

For complete information, write us today or communicate with your nearest W&T representative.

Massometer

Merchen Scale Meter

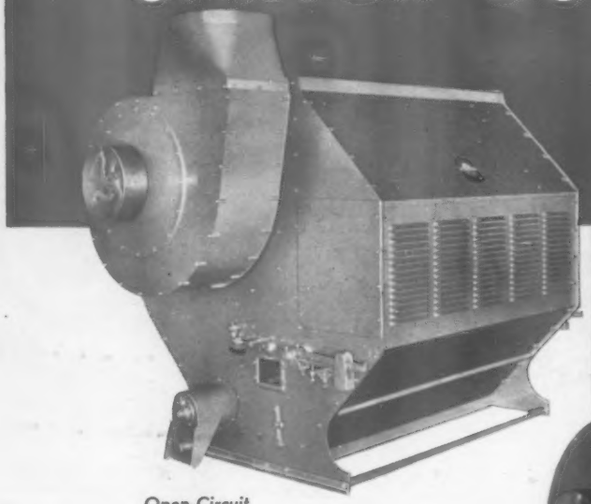
WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

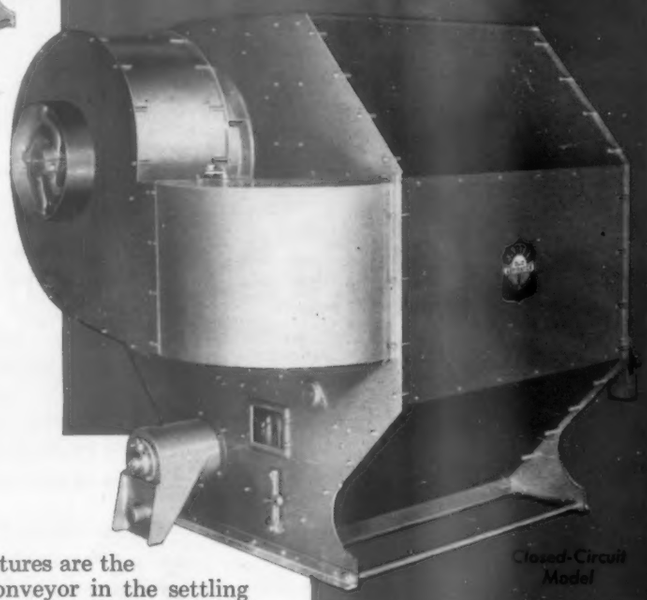
M-29

CARTER DUO-ASPIRATOR

Your choice of
OPEN CIRCUIT OR CLOSED CIRCUIT MODELS



Open-Circuit Model



Closed-Circuit Model

The closed-circuit Duo-Aspirator provides two separations: the grain or heavier material is aspirated, and the lighter material removed. The open-circuit model provides three-way separation: the grain or other material is aspirated, the heavier material removed by aspiration is discharged from the settling chamber, and dust and other light material are exhausted from the fan to a collector.

Outstanding among recently added features are the drop-bottom clean-out beneath the conveyor in the settling chamber, and a self-cleaning suction tube leading to the fan ... which combine to prevent any accumulation of material within the machine.

Other important features include: all-metal construction ... ball-bearings throughout ... compactness ... low power requirement.

With Motor Drive

Avoid unnecessary losses by testing your grain by official standards.

HART-CARTER COMPANY

473 Nineteenth Avenue N. E. · Minneapolis 13, Minnesota